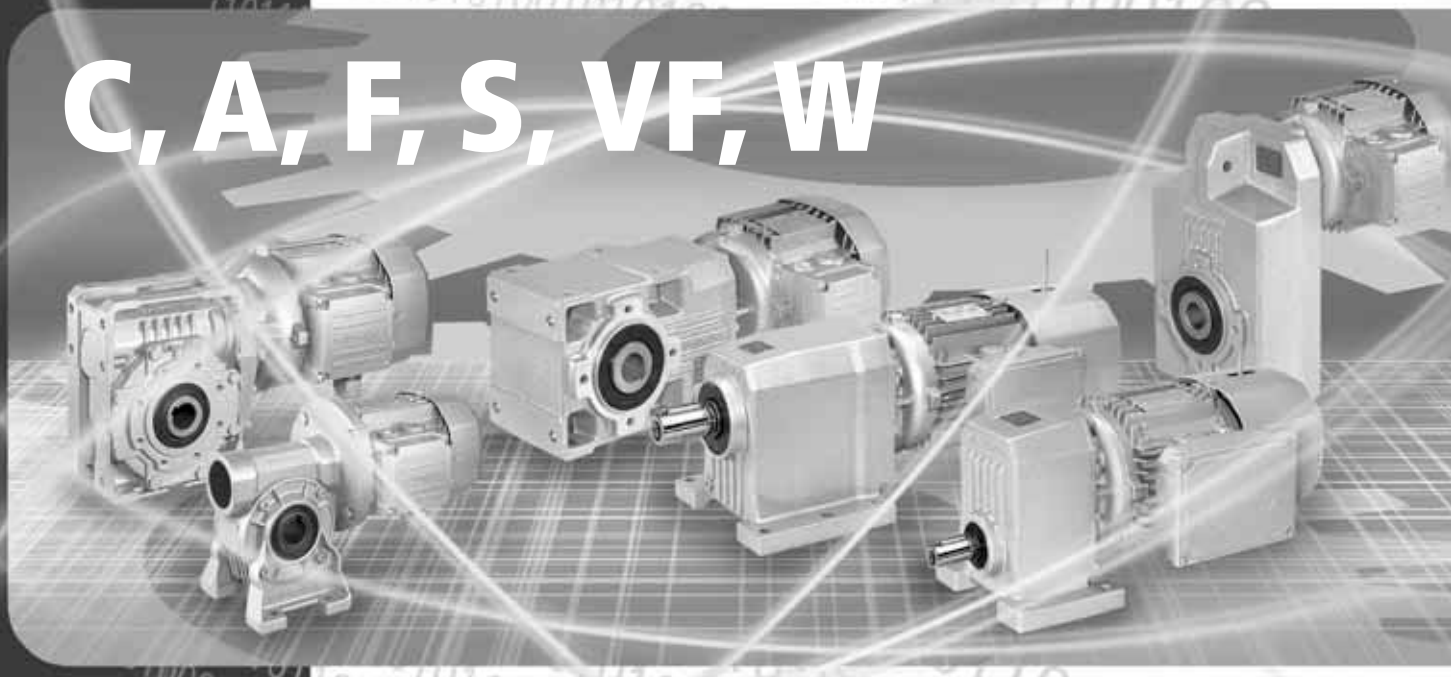
INDUSTRY PROCESS
AND AUTOMATION SOLUTIONS

BONFIGLIOLI
RIDUTTORI

Installation, use and service manual

GB

C, A, F, S, VF, W



ATEX
INCLUDED

BONFIGLIOLI

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Revisions
Refer to page 50 for the catalogue revision index. Visit www.bonfiglioli.com to search for catalogues with up-to-date revisions.

1.0 - GENERAL INFORMATION

1.1 - PURPOSE OF THE MANUAL

This manual has been compiled by the Manufacturer to provide information on the safe transport, handling, installation, maintenance, repair, disassembly and dismantling of the gear units.

All purchasing and design criteria is provided in the Sales Catalogue. Apart from adhering to established engineering practices, the information given in this manual must be carefully read and applied rigorously.

The information regarding the electric motor that can be found matching the speed reducer is supplied with the owner's manual relevant to the specific electric motor.

Failure to adhere to the information provided herein may result in risk to personal health and safety, and may incur economic damages.

This information, provided in the original language (Italian) of the Manufacturer, may also be made available in other languages to meet legal and/or commercial requirements.

The documentation must be stored by a person with the correct authority and must always be made available for consultation.

In case of loss or damage, replacement documentation must be requested directly from the Manufacturer, quoting the code of this manual.

The manual reflects the state of the art at the time of commercialisation of the gear unit.
The Manufacturer reserves the right to modify, supplement and improve the manual, without the present publication being for that reason considered inadequate.

Particularly significant sections of the manual and important specifications are highlighted by symbols whose meanings are given below.

SYMBOLS:

DANGER - WARNING

This symbol indicates situations of serious danger which, if ignored, may result in serious risks to the health and safety of personnel.

CAUTION - ATTENTION

This symbol indicates the need to adopt specific precautions to avoid risks to the health and safety of personnel and possible economic damages.

IMPORTANT

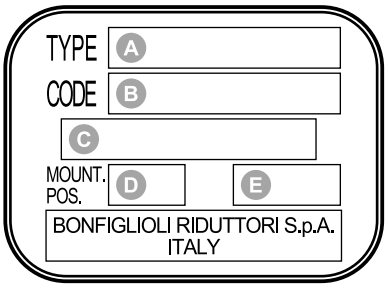
This symbol indicates important technical information.

The instructions indicated on a yellow background next to these symbols refer exclusively to equipment conforming to the "ATEX" Directive 94/9/EC.
The operations highlighted by these symbols must be carried out by qualified professionals specially trained in the safety requirements for zones characterised by potentially explosive atmospheres.
Failure to observe these instructions may result in serious risks to personal and environmental safety

1.2 - EQUIPMENT IDENTIFICATION

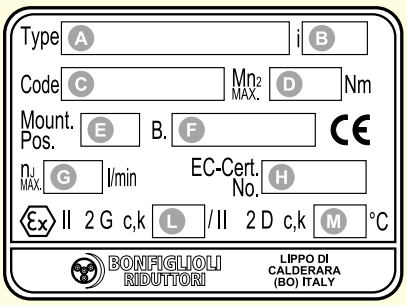
The gear unit bears the following nameplate. The nameplate bears all references and indispensable safety instructions. The gear unit's identifying code is explained in the Sales Catalogue.
If the gear unit is supplied complete with electric motor (gearmotor), all information regarding the motor itself is supplied in the motor manual.

Nameplate data



- **A** Gear unit type.
- **B** Product code.
- **C** Month / Year of manufacture.
- **D** Mounting position.
- **E** Gear ratio.

Nameplate for ATEX-specified gear units:



- **A** Gear unit type.
- **B** Gear ratio.
- **C** Product code.
- **D** Transmissible torque at n_1=1400 rpm [Nm].
- **E** Mounting position.
- **F** Month / Year of manufacture.
- **G** Maximum drive speed.
- **H** Certification Nr.
- **L** Temperature class, or maximum surface temperature.
- **M** Maximum surface temperature.

CE - ExMark

- Environmental limits (ambient temperature range between - 20°C and + 40° C).
- Maximum surface temperature: temperature class **T4** for 2G and **130°C** for 2D.
  Some types of gear unit, shown in the catalogue, are exceptions to this rule and are marked temperature class **T3** for 2G or **160°C** for 2G and 2D.
- Certifying agency with whom the technical file has been deposited.

Readability of the nameplate

The nameplate and the information thereon must be readable at all times and consequently cleaned from time to time.

Should the nameplate wear and/or become damaged so as to affect its readability or that of even one of the items of information thereon, the User must request a new nameplate from the Manufacturer, quoting the information given in this manual, and replace the old one.

1.3 - GLOSSARY AND TERMINOLOGY

Some of the frequently occurring terms used in this manual are described below so as to unequivocally define their meaning.

Routine maintenance: the set of operations required for maintaining the functionality and efficiency of the gear unit. These operations are usually scheduled by the Manufacturer, who defines the qualifications required and tasks in question.

Non-routine maintenance: the set of operations required for maintaining the functionality and efficiency of the gear unit. These operations are not scheduled by the Manufacturer and must be done by an expert maintenance technician.

Expert maintenance technician: an authorised technician selected by means of having the qualifications, skills and mechanical and electrical training to do repairs and non-routine maintenance work on the gear unit.

Overhaul: an overhaul consists in the replacement of bearings and/or other mechanical components which have worn to such an extent as to compromise the operation of the gear unit. The overhaul also includes verification of the condition of all gear unit components (keys, seals, gaskets, vents, etc.). If any such components are damaged they must be replaced and the reason for the damage identified.

1.4 - REQUESTING TECHNICAL ASSISTANCE

For any technical service needs, contact the Manufacturer's sales network, quoting the information on the unit's nameplate, the approximate hours of service and the type of defect.

1.5 - MANUFACTURER'S LIABILITY

The Manufacturer declines all liability for cases of:

- use of the gear unit in violation of local laws on safety and accident prevention at work.
- incorrect installation, disregard or incorrect application of the instructions provided in this manual.
- incorrect or defective power supply (gearmotors).
- modifications or tampering.
- work done on the unit by unqualified or unsuitable persons.

The safety of the gear unit also depends on scrupulous observance of the instructions given in this manual, in particular:

- always operate the unit within its operating limits.
- diligently observe the routine maintenance schedule.
- only authorise trained operators to inspect and service the unit.
- use only original spare parts.

- the configurations given in the gear unit catalogue are the only ones permitted.
- do not attempt to use the unit contrary to the instructions supplied.
- the instructions given in this manual do not substitute but summarise the provisions of applicable safety legislation.

2.0 - TECHNICAL INFORMATION

2.1 - GEAR UNIT DESCRIPTION

The gear unit has been designed and constructed for integration, if required, driven by an electric motor, into an assembly of interlocking parts or mechanisms as part of a specific application.
Depending on the requirements of the application, the gear unit can be supplied in a variety of executions and configurations. It is capable of satisfying a range of specific requirements in the mechanical, chemical, agricultural and food industries, etc.
BONFIGLIOLI RIDUTTORI supplies a range of accessories and optionals to make their products as versatile as possible. For further technical information and descriptions, refer to the Sales Catalogue.
The User is responsible for using the products recommended for installation and maintenance of BONFIGLIOLI gear units in an appropriate manner and in accordance with instructions.

SAFETY SPECIFICATIONS FOR ATEX SPECIFIED GEAR UNITS

- use of synthetic lubricants only (oil and grease)
- VITON® seal rings
- thread locker on all external bolts
- vent caps with anti-intrusion valve
- double oil seals on series C gear units, and oil seals with dust traps on all other types
- components and products operable at above the maximum rated operating temperature
- no metal moving parts external to the gear unit
- no plastic parts capable of building up electrostatic charge
- irreversible temperature indicator supplied along with each unit
- for installations in zones 21 and 22 the User must schedule and implement a regular cleaning programme of all surfaces and recesses to avoid a build up of dust of more than 5 mm in depth
- to prevent dust build-ups in difficult to access areas, the units are equipped with a variety of seals in proximity to the couplings of moving parts, mounting flanges and external threaded holes.

2.2 - CONFORMITY TO STANDARDS

All gear units or gearmotors (when supplied complete with electric motor) are designed in compliance with the provisions of all applicable Essential Health and Safety Requirements, “Machinery Directive” 98/37/EC and, if requested, can be supplied complete with Manufacturer’s Declaration – Annex IIB as provided by said directive.
The electric motors of all BONFIGLIOLI RIDUTTORI gearmotors conform to the provisions of Low Voltage Directive 73/23/EEC and Electromagnetic Compatibility Directive 89/336/EEC.

Furthermore, if specified for use in potentially explosive atmospheres, the gear units are designed and constructed to conform with the Essential Health and Safety Requirements (EHSR) of Annex II of ATEX Directive 94/9/EC and conform to the following classification:

- Equipment group: **II**.
- Calass: Gas **2G** – Dust **2D.**
- Zone: Gas **1** – Dust **21.**
- Maximum surface temperature: temperature class **T4** for 2G and **130°C** for 2D.
  Some types of gear units, given in the catalogue, are exceptions to this rule and are marked temperature class **T3** for 2G or **160°C** for 2G and 2D.

2.3 - OPERATING LIMITS AND CONDITIONS

Modification of the gearbox configuration or mounting position is only permitted if previously authorised by the BONFIGLIOLI RIDUTTORI technical service.

Failure to obtain said authorisation voids the ATEX certification.

Ambient conditions

- Ambient temperature: min. - 20°C; max. + 40°C.
- Do not use the gear unit, if not explicitly intended for the purpose, in a potentially explosive atmosphere or where the use of explosion-proof equipment is specified.

The nameplate data on the maximum surface temperature, refer to measurements made in normal ambient and installation conditions. Even minimal variations to said conditions (e.g. smaller mounting cabinet) could have a significant impact on the build up of heat.

- Lighting

If the unit is to be serviced in a poorly lit area, use additional lamps and ensure that the work is done in compliance with applicable safety legislation.

- Noise - Vibration

During operational testing at the Manufacturer's premises, the acoustic pressure measured under full load at a distance of 1 m from the unit and 1.6 m above ground level without vibration was less than 85 dB(A).

The vibrations produced by the gear unit do not constitute a health risk for personnel. Excessive vibration may be the result of a fault and should be immediately reported and eliminated.

3.0 - SAFETY INFORMATION

3.1 - SAFETY STANDARDS

- Carefully read the instructions given in this manual and those posted directly on the gear unit, especially those regarding safety.
- Persons charged with working on the gear unit at any time in its service life must be trained specifically for the purpose with special abilities and experience in this area as well as being equipped with the appropriate tools and individual safety equipment (as per Legislative Decree 626/94). Failure to meet these requirements constitutes a risk to personal health and safety.
- Use the gear unit only for the applications envisaged by the Manufacturer. Improper use can result in risks to personal health and safety and economic damages.

The applications defined by the Manufacturer are those industrial applications for which the gear unit has been developed.

- Keep the gear unit at its maximum efficiency by following the routine maintenance schedule. Good maintenance enables the unit to operate at maximum performance over a long service life in compliance with safety regulations.
- When working on the unit in areas which are difficult to access or hazardous, ensure that adequate safety precautions have been taken for the operator and others in compliance with the provisions of law on health and safety at work.
- All maintenance, inspection and repairs must only be done by an expert maintenance technician fully familiar with the attendant hazards. It is, therefore, essential to implement operating procedures which address potential hazards and their prevention for the entire machine. The expert maintenance technician must always work with extreme caution in full compliance with applicable safety standards.

If the gear unit is to be serviced in a potentially explosive atmosphere, the operator must first switch off power to the gear unit and ensure that it is out of service, as well as taking all necessary precautions against it being accidentally switched on again or its parts moving without warning.
Furthermore, all additional environmental safety precautions must be taken (e.g. elimination of residual gas or dust, etc.).

- During operation wear only the apparel and safety equipment indicated in the User instructions provided by the Manufacturer or laid down by applicable laws on safety at work.
- Replace worn components with original spare parts. Use the lubricants (oil and grease) recommended by the Manufacturer.
- Do not dump polluting materials into the environment. Dispose of all such materials as stipulated by applicable legislation.
- After replacing lubricants clean the gear unit's surfaces and the walk-on surfaces around the work area.

4.0 - HANDLING AND TRANSPORT

4.1 - PACKAGING

The standard packaging, when supplied and unless otherwise agreed, is not proofed against rainfall and is intended for shipping by ground and not sea, and for environments which are under cover and not humid.
The material can be stored in suitable conditions for a period of two years under cover at a temperature between –15 °C and +50 °C at a relative humidity not in excess of 80%. Storage in all other conditions requires specific packaging.
In order to facilitate handling, heavy packages can be loaded on pallets.

The most frequent types of packaging are shown in the figures below.

- Wooden crate for miscellaneous products shipped by sea.

- Carton pallet packaging for single products and kits.

Horizontal packaging

Vertical packaging

On receipt of the gear unit, check that the delivery item corresponds to the purchase order and that it is not damaged or faulty in any way. Refer any nonconformity to your BONFIGLIOLI RIDUTTORI dealer.

Dispose of packaging materials as laid down by the provisions of law.

4.2 - HANDLING INSTRUCTIONS

Handle packages as per the Manufacturer's instructions and those marked on the packages themselves. Since the weight and shape of packages may make manual handling unfeasible, special equipment must be used to avoid damage and injury. Persons authorised for this purpose must be trained and experienced in the work in question to safeguard his safety and that of all other persons involved.

The person authorised to handle the product must take all necessary precautions to safeguard his safety and that of all other persons involved.

4.2.1 - Moving packages

- Prepare a suitable, delimited area with a level floor or surface for unloading the packages.
- Prepare the equipment required for handling the package. The lifting and handling equipment used (e.g. crane or lift truck) must have adequate capacity for the weight and size of the load, taking into account its attachment points and centre of gravity. If required, this information is indicated on the package itself. Harness heavy packages with chains, belts and steel ropes after checking that they are capable of sustaining the weight of the load, which is generally specified.
- When handling the load keep it level to avoid instability and/or tipping.

4.2.2 - Moving the equipment

All the following operations must be done with due care and caution and without sudden movements.

- Identify the attachment points for lifting the gear unit. Refer to Annex 4 of this manual for this information.
- Prepare the gear unit for lifting by attaching straps, hooks, shackles etc. to its attachment points, or alternatively, use a pallet for moving the load. If using a crane, first lift the gear unit vertically out of its packaging.
- If using a lift truck or pallet truck, remove the packaging and fit the truck's forks at the indicated positions.
- First lift the load very slowly to check that it is stable.
- Move the gear unit to the unloading area and lower it gently into position, taking care not to cause sudden oscillations while moving it.

If the gear unit is coupled to an electric motor, do not use the eyebolts on the motor for lifting the entire load, unless this is expressly indicated.

4.3 - STORAGE

Some recommendations for storing the gear unit are indicated below.

1. Do not store the unit in excessively humid conditions or where it is exposed to the weather (do not store outdoors).
2. Do not place the gear unit directly on the ground.
3. Place the gear unit on a stable base and make sure that it is not subjected to accidental displacement.
4. Store the packaged gear unit (if allowed) in accordance with the instructions on the packaging itself.

If the gear unit is stored for more than 6 months, the following **additional** precautions must be taken:

5. Cover all machined external surfaces with a rustproofing product such as Shell Ensis or equivalent product with similar properties and application range.
6. Fill the unit with lubricating oil.

SAFETY PRECAUTIONS to be taken when returning the gear unit to service after storage.

The output shafts and external surfaces must be thoroughly cleaned of all rustproofing product, contaminants and other impurities (use a standard commercial solvent).
Do this outside any explosion hazard area.

The solvent must not touch the seal rings as this can damage them and render them ineffective.

If the oil or protective material used during storage is not compatible with the synthetic oil used during the machine's operation, the interior of the unit must be thoroughly cleaned before filling with the operating oil.

The service life of bearing grease is reduced if the unit is stored for more than 1 year.
The bearing grease must be synthetic.

5.0 - INSTALLATION

5.1 - INSTALLING THE GEAR UNIT

The entire installation process must be planned based on the general design of the machine. The person authorised to do the work must, if necessary, implement a safety plan to safeguard all persons directly involved and rigorously apply all applicable legislation.

If a gearmotor is going to be installed, please consult the owner's manual of the electric motor on beforehand.

1. Thoroughly clean all packaging materials and protective product residue from the gear unit. Pay particular attention to the coupling surfaces.
2. Check that the data on the nameplate corresponds to that which is specified on the order.
3. Ensure that the structure to which the gear unit is to be mounted is sufficiently robust and rigid to support its weight and operating stresses.
4. Check that the machine on which the gear unit is to be installed is switched off and cannot be accidentally switched on again.
5. Check that all coupling surfaces are flat.
6. Check that the shaft/shaft or shaft/bore are perfectly aligned for coupling.
7. Fit suitable guards to protect against the external moving parts of the gear unit.
8. If the work environment is corrosive for the gear unit or any of its parts, take the special precautions required for aggressive environments. In this case, contact the BONFIGLIOLI RIDUTTORI sales service.
9. We recommend applying a protective paste to all couplings between the gear unit/motor and other parts (Klüberpaste 46 MR 401 or equivalent product with similar properties and application range) to ensure optimal coupling and protection against fretting corrosion.
10. To ensure effective coupling, the driven shafts should be machined to the tolerances given in tables (A16), (A17), (A18), (A19), (A20) and (A21) in Annex 3 of this Manual.
11. In case of installation outdoors and when fitted with an electric motor, protect the latter from direct sunlight and the weather by means of guards or a casing. Also make sure that the assembly is properly ventilated.

Now proceed with the installation as follows:

1. Place the gear unit in the vicinity of the installation area.
2. Mount the gear unit and secure it to the structure at the points provided. The gear unit should be secured to the structure through all mounting points on the mount specified (feet or flange).
3. Locate the closed plug used for transportation (usually red) and replace it with the vented plug provided.
4. Tighten down the mounting bolts and check that the oil plugs are screwed down to the torque given in table (A0).

(A0)

Bolt size	Tightening torque [Nm] +5% /-10%	
	Bolt class	
	8.8	**10.9**
M4	3	3.8
M5	5.9	8.0
M6	10.3	13.0
M8	25.5	32
M10	50	64
M12	87.3	110
M14	138.3	180
M16	210.9	275
M18	306	390
M20	432	540
M22	592	720
M24	744	930
M27	1100	1400
M30	1500	1850

Cap/vent thread	Pitch	Tightening torque [Nm]
1/8"	28	5
1/4"	19	7
3/8"	19	7
1/2"	14	14
3/4"	14	14
1"	11	25

5. Charge the gear unit with oil or top it up with reference to the method in which gear units of the type covered by this manual are filled in the factory. The standard charge of synthetic life-time lubricant is as follows:

(A1)

C 05	C 11	C 21	C 31	C 35	C 41	C 51	C 61	C 70	C 80	C 90	C 100
A 10	A 20	A 30	A 41	A 50	A 60	A 70	A 80	A 90			
F 10	F 20	F 30	F 40	F 50	F 60	F 70	F 80	F 90			
S 10	S 20	S 30	S 40	S 50							
VF 27	VF 30	VF 44	VF 49	VF 130	VF 150	VF 185	VF 210	VF 250			
W 63	W 75	W 86	W 110								

Life-time lubrication.

Life-time lubrication with ATEX-specified unit only.

Helical in-line gear units C 11, C 21 and C 31 are not equipped with service plugs for direct oil level checks.
Bevel helical gear units A 10, A 20 and A 30 are not equipped with service plugs for direct oil level checks in mounting positions B6 and B7 only.

For these types of gear units, refer to Annex 1 of this Manual.

Before installing, check the unit as follows:

1. Place the gear unit in the mounting position indicated for the gear unit in question in Annex 1. Wait 10 minutes for the oil level to stabilise inside the gear unit's casing.
2. Insert a dipstick through the hole shown in drawing (S4) or (S5) and measure the distance between the oil level and the exterior of the casing. This value must be compared with the **values in mm** given in Annex 1, tables (A7) and (A8), depending on the mounting position for the gear unit in question.
3. If the measurement gives a higher value than that prescribed, top up the oil to the correct level as indicated in the catalogue.

For all other types of gear unit the oil level must be checked via the oil plug (spill type) using the tool (out of scope for supply) described in Annex 1.

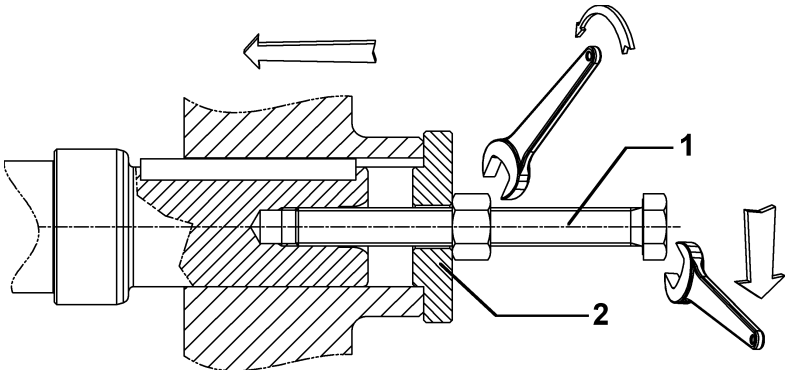
For the first charge and subsequent top ups, only use the recommended oils.

Installation of gear units classified under Directive 94/9/EC

- Category 2D gear units must be installed in compliance with the provisions of standards EN 1127-1 and EN 50281-1-2. The installer must, therefore, be fully informed and trained for this application.
- The installation technician must be aware of the ATEX class of the installation area, as well as the risks associated with the presence of a potentially explosive atmosphere, with particular attention to explosion and fire hazards, and thereby adopt the necessary safety precautions.
- All maintenance, assembly and disassembly work must be done **outside the explosion hazard area** by trained personnel.
- Check that all accessory components (cables, joints, cable glands, cooling units, etc.) comply with the Essential Health and Safety Requirements of the ATEX directives. Handle them with extreme care to avoid altering their characteristics.
- Remove the bolts sealing the threaded holes if provided for securing the gear unit. Do not damage the coupling surfaces.
- When assembling gear units with a torque arm, make sure that during operation, the metal parts which move relative to each other do not come into contact. If necessary, insert non-metal anti-friction elements in compliance with Directive 94/9/EC.
- Do not connect any object with electrical resistance greater than $10^9\ \Omega$ to the product.
- Install guards to prevent the hazardous accumulation of dust and liquids on the seals of the solid shafts and to protect them mechanically.
- In case of installation of the gearmotor in a vertically downward orientation, the electric motor must be equipped with a drip cover.
- The output shaft and any pulleys or other transmission components must be perfectly aligned.
- Only install the gear unit in the motor execution and mounting position specified on the order. Shaft-mounted gear units can be installed with a tolerance relative to the theoretical plane of installation of ± 5°.
- If the gear unit is supplied without lubricant it must be installed as such and only filled with lubricant thereafter.
- Secure the gear unit to a flat, vibration-free surface capable of bearing the torsional stresses it produces in operation. Make sure not to deform the contact surfaces, mounting feet and/or flanges by overtightening the bolts.
- Use bolts of quality no lower than 8.8 for mounting the gear unit, and for heavy-duty installations use 10.9 bolts. For the tightening torque refer to table (A0). To prevent bolts from unscrewing, apply a thin film of Loctite 510, or equivalent, on threads of all bolts used to assemble the gear unit onto the structure and/or to the electric motor.
- Make sure that the radial/thrust loads and operating torques do not exceed those specified for the unit.
- The vent caps and oil level caps must be easy to access for inspection.
- Clean the gear unit thoroughly after installation.

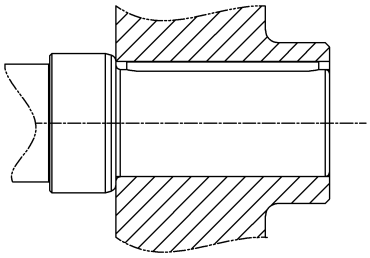
5.1.1 - Gear units with solid output shaft

For mounting external parts do not use hammers or other tools which might damage the gear unit's shafts or bearings. Instead, proceed as indicated in the diagram below:

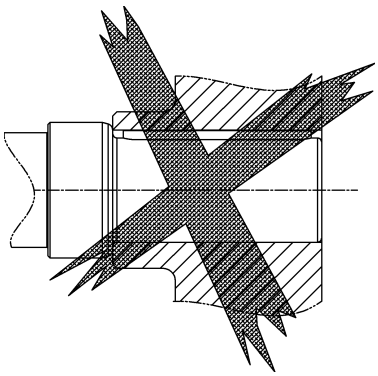


Bolt (1) and spacer (2) are to be supplied by customer.

To minimise the loads on the shaft bearings, when mounting transmission elements with asymmetrical hubs, the preferred layout is shown in diagram (**A**) below:

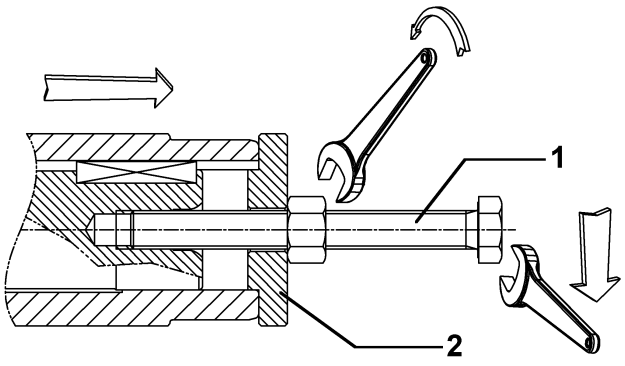


(A)



5.1.2 - Gear units with hollow output shaft

To facilitate mounting hollow shaft gear units onto the machine's driven shaft, proceed as indicated in the diagram below. Also refer to Annex 3 of this Manual for dimension information on customer's shaft.



The bolt (1) and spacer (2) are to be supplied by customer.

5.1.3 - Gear units with shrink disk

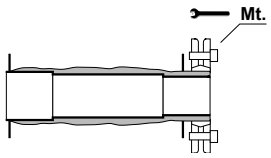
Series A and F gear units may be specified with a shrink disk for coupling onto the driven shaft. When installing a unit of this type, proceed as follows:

1. Loosen the locking bolts gradually and in sequence and remove the entire shrink disk.
2. Clean and carefully degrease the coupling surface between the gear unit's output shaft and the customer shaft.

Do not use molybdenum bisulphide or any other grease which would affect the friction coefficient of the coupling surfaces and reduce the performance of the shrink disk.

3. Fit the gear unit onto the machine sliding its output shaft onto the driven shaft.
4. Fit the shrink disk to the gear unit shaft.
5. Fully tighten down the shrink disk bolts gradually following a circular sequence using a torque wrench. This operation usually must be repeated several times to reach the tightening torque **Mt** specified in the table below:

(A2)



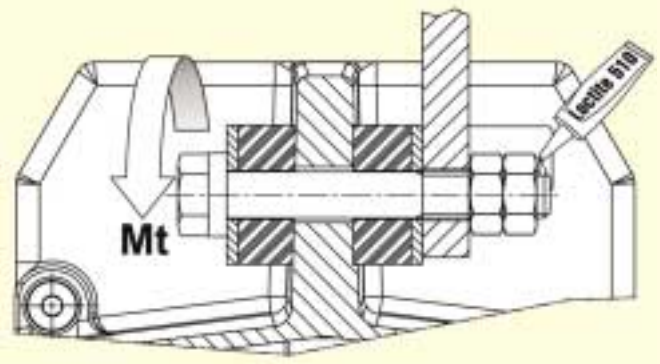
	A 10	A 20	A 30	A 41	A 50	A 60	A 70	A 80	A 90
Mt [Nm]	14.5	14.5	14.5	14.5	35	35	35	69	69
	F 10	**F 20**	**F 30**	**F 40**	**F 50**	**F 60**	**F 70**	**F 80**	**F 90**
Mt [Nm]	8.5	14.5	14.5	14.5	14.5	35	35	69	69

5.1.4 - Shaft mounted gear units series F

Anchoring the torque arm

Use the original vibration-damping kit to ensure optimal operation of the assembly, as it is specifically designed and constructed, along with the gear unit, for operation in explosion hazard areas.

Failure to use the original accessory on gear units classified under 94/9/EC voids the ATEX certification.



	Mt [Nm]
F 10	10
F 20	10
F 30	20
F 40	20
F 50	50
F 60	50

The torque arm shown in the diagram is to be supplied by customer.

5.2 - INSTALLING AN IEC-STANDARD FLANGED MOTOR

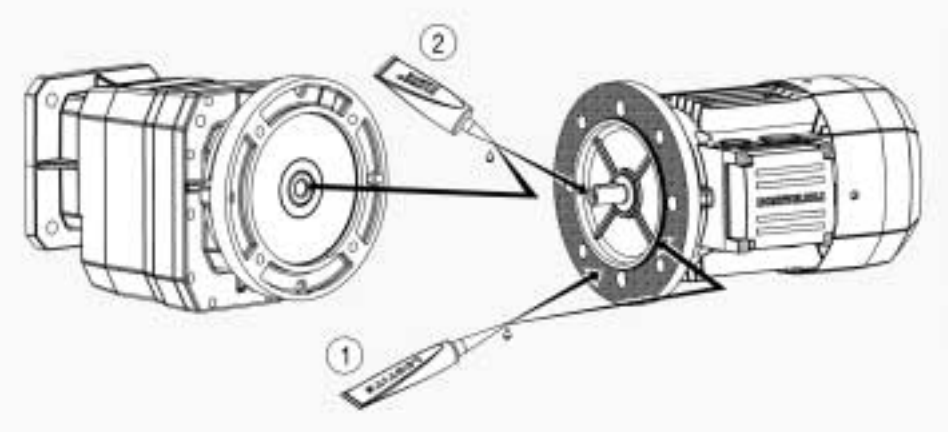
Further to all the precautions indicated above, when installing a IEC-flange mount electric motor the following precautions must also be observed:

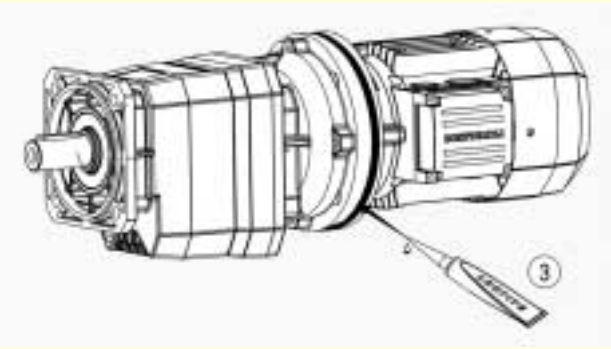
- Do not force the coupling and do not use inappropriate tools during assembly. Take care not to damage the flat and/or cylindrical coupling surfaces.
- Do not force the shaft with large radial and/or thrust loads.
- To facilitate assembly, use a lubricating synthetic oil paste such as Klüberpaste 46 MR 401 or equivalent product with similar properties and application range.
- Tighten down all motor/gear unit mounting bolts to their prescribed torque. For the tightening torques, refer to table (A0).

When the gear unit is mounted to an IEC electric motor, proceed as follows:

- Apply a layer of sealant (Loctite 510 or equivalent product with similar properties and application range) to the motor/gear unit mounting flanges, spigot and frontal coupling surfaces as shown in diagram (S1).

(S1)





1 - Apply “Loctite 510” to both the flange surface and spigot.

2 - Apply “Klüberpaste 46MR401” to the input shaft bore and motor shaft.

3 - Use “Loctite 5366” to seal the area of contact between the gear unit and motor, taking care to fill in any gaps between the two flanges (e.g. disassembly slots).

- After mounting the motor, apply a layer of sealant (Loctite 5366 or equivalent product with similar properties and application range) around the edges of the flanges so as to close any gaps between their surfaces.
- If the gearbox is of the flanged type, the User must take similar precautions to prevent dust deposits forming in the gaps between the flanges or in the vicinity of the couplings.

6.0 - TESTING THE GEAR UNIT

The gear unit has been factory tested by the Manufacturer.

Before starting the unit, check that:

- The machine incorporating the gear unit complies with the provisions of the “Machinery Directive” 98/37/EC and any other applicable safety legislation.
- The gear unit’s mounting position in the installation corresponds to that prescribed and indicated on the nameplate.
- The electrical power supply and control systems are suitable and operational as stipulated in standard EN 60204-1, and grounded as per standard EN 50014.
- The motor power supply corresponds to that prescribed and is within ± 5% of the rated value.
- The oil level is as prescribed and that there are no leaks from the caps or gaskets.
- The unit does not run noisily or with excessive vibration.

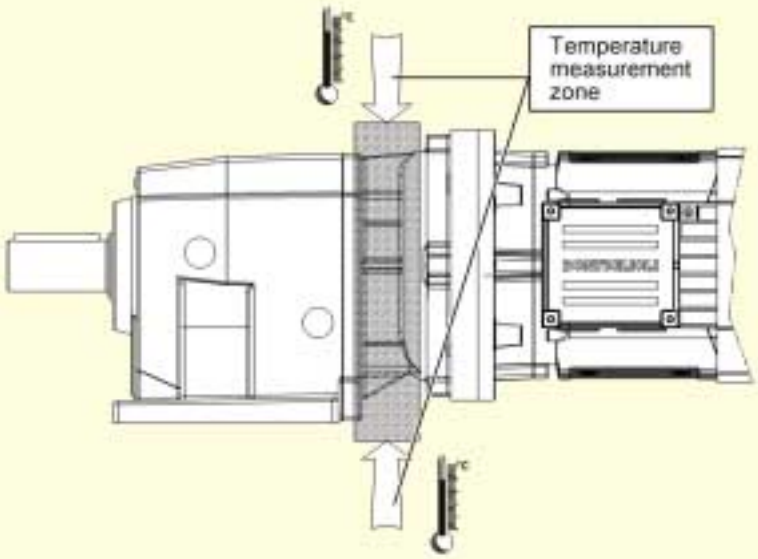
Before starting up the unit, check and ensure that:

- Assembly is not carried out in a potentially explosive atmosphere (oil, acid, gas, vapour or radiation) and that there is no dust deposits thicker than 5 mm on the gear unit.
- During service the gear unit is sufficiently ventilated and that it is not subject to radiation from external heat sources.
- During service the cooling air does not exceed 40 °C.
- The oil level, drain and vent plugs are all easily accessible.
- All accessories of any type mounted onto the gear unit are ATEX compliant.
- Gear units with hollow shafts, with or without shrink disk, have been correctly mounted.
- The gear unit is thoroughly cleaned after installation.
- All guards installed to prevent accidental contact between operators and the gear unit’s moving parts or seals, are effective.

Measuring the gear unit's surface temperature

- The gear unit's maximum surface temperature depends on the motor speed, gear ratio and motor execution and must never exceed 130 °C (160 °C if so specified on the nameplate).
- The nameplate specifications regarding the maximum surface temperature, refer to measurements made in normal ambient and installation conditions. Even minimal variations to said conditions (e.g. smaller mounting cabinet) could have a significant impact on the build up of heat.
- When commissioning the gear unit, the surface temperature must be measured in the same operating conditions as for the final application.
  The surface temperature must be measured at the coupling between the gear unit and motor, and at the points which are most shielded from the motor's fan cooling.

(S2)



IMPORTANT:

The maximum surface temperature is reached after 3 hours' operation at full load. The temperature measured in these conditions must not differ (ΔT) from the ambient temperature by more than the following values:

(A3)

	ΔT [°C]
C 11...C 61	75
A 10...A 60	75
F 10...F 60	75
VF 44, VF 49	75
W 63...W 86	75
W 110	90

Should the temperature differential exceed these values, stop the gear unit at once and contact the BONFIGLIOLI RIDUTTORI technical service.

- If the temperature differential is within the above values, wait for the gear unit to cool down and then install the temperature indicator supplied with the gear unit at the point of maximum temperature.

Example:

- At the same time, check for excessive running noise and vibration.

- **Provided all the above checks have been passed and that all other instructions in this manual have been strictly observed, an electric motor with ATEX rating equal or greater than that of the gear unit may be installed, thus forming a gearmotor which itself complies with the provisions of Directive 94/9/EC.**

  If, on the other hand, the installation of the motor to the gear unit requires actions other than those prescribed in this Manual and/or one or more of the manual's prescriptions has not been satisfied, the User shall be responsible for analysing the risks attendant on this particular motor/gear unit combination. The risk analysis is in any case mandatory if the motor is driven through an inverter.

  Only in this way, and subject to certification by the assembler, shall the assembly, including the gear unit itself, be compliant with the requirements of Directive 94/9/EC.

7.0 - USING THE EQUIPMENT

Before putting the gear unit into service, the User must ensure that the plant in which it is installed complies with all applicable directives, especially those regarding health and safety at work.

The gear unit may not be used in areas and environments:

- with highly corrosive and/or abrasive vapours, smoke or dust
- in direct contact with loose food products.

Danger zones and exposed persons:

The danger zone of the gear unit is the protrusion of the shaft which constitutes a hazard for exposed persons in direct contact with it (crushing, cutting, trapping). In particular, when the gear unit is operating in automatic mode and in an accessible area, the shaft must be protected by a guard.

8.0 - MAINTENANCE

Maintenance and replacement work must be done by expert maintenance technicians trained in the observance of applicable laws on health and safety at work and the special ambient problems attendant on the installation.

Before doing any work on the unit, the operator must first switch off power to the gear unit and ensure that it is out of service, as well as taking all necessary precautions against it being accidentally switched on again or its parts moving without warning (due to suspended loads or similar external factors).
Furthermore, all additional environmental safety precautions must be taken (e.g. elimination of residual gas or dust, etc.).

- Before doing any maintenance work, activate all safety equipment and, if necessary, inform persons working in the vicinity. In particular, mark off the area around the unit and prevent access to any equipment which, if activated, might be the cause of unexpected health and safety hazards.
- Replace worn components with original spare parts only.
- Use the lubricants (oil and grease) recommended by the Manufacturer.
- When working on the gear unit always replace gaskets and seals with new original ones.
- If a bearing requires replacement, it is good practice to also replace the other bearing supporting the same shaft.
- We recommend replacing the lubricating oil after all maintenance work.

The above instructions are aimed at ensuring efficient and safe operation of the gear unit.

The Manufacturer declines all liability for injury and damage to components due to the use of non-original spare parts and non-routine work which modifies the safety requirements without the express prior authorisation of the Manufacturer.

Refer to the specific spare parts catalogue when ordering spare parts for the gear unit.

Do not dump polluting liquids, worn parts and maintenance waste into the environment. Dispose of all such materials as stipulated by applicable legislation.

- Observe the routine inspection and maintenance schedule to ensure suitable operating conditions and the effective explosion protection of the unit.
- Always apply fresh Loctite 510 paste or equivalent product with similar properties and application range to all disassembled threads.
- Before servicing or repairing internal components, allow the gear unit to cool down completely before opening the casing so as to avoid burns from parts which are still hot.
- Make sure, on completion of maintenance work, that all safety measures and equipment have been applied and reset.
- Clean the gear unit thoroughly after maintenance work and repairs.
- On completion of maintenance work, tighten all vent, filler and level plugs to their specified torque (table A0).
- On completion of any maintenance work, all seals must be refitted and sealed as prescribed. On gear units with double seal rings, the cavity between the two rings must be packed with synthetic grease (Fluorocarbon gel 880 ITP or equivalent product with similar properties and application range) before assembly.
- Regardless of the type of gear unit, whenever a seal ring is replaced its lips should be smeared with a thin layer of grease (Fluorocarbon gel 880 ITP or equivalent product with similar properties and application range) before assembly.
- Use only original spare parts for repairs.

8.1 - ROUTINE MAINTENANCE

Keep the gear unit at its maximum efficiency by following the routine maintenance schedule specified by the Manufacturer.
Good maintenance enables the unit to operate at its maximum performance over a long service life in compliance with safety regulations.

Frequency	Component	Type of work	Operation
1000 h	External seals and gaskets	Check oil level Check for leaks by eye	Maintain or replace components as required
3000 h	For gear units with torque arm: polymer bushings	Check for cracks/ageing	Replace if no longer fully effective
5000 h	Gear unit seals and gaskets	Inspect carefully for wear/ageing of external seals.	Replace if aged/worn

Depending on the temperature reached by the lubricant, it should be replaced at the intervals indicated in table (A4) below:

(A4)

Oil temperature **t** [°C]	**Hours**
$t < 65$	25000
$65 \leq t < 80$	15000
$80 \leq t \leq 95$	12500

For installations in zones 21 and 22 the User must schedule and implement a regular cleaning programme for all surfaces and recesses to avoid build up of dust more than 5 mm in depth.

Every 1000 h of operation or after 6 months:

- Measure the surface temperature of the coupling between the gear unit and motor, at the points most shielded from the motor's fan cooling. The maximum temperature must not differ (Δ**T**) from the ambient temperature by more than the following values, nor may this differential be exceeded during operation.

(A3)

	Δ**T** [°C]
C 11...C 61	75
A 10...A 60	75
F 10...F 60	75
VF 44, VF 49	75
W 63...W 86	75
W 110	90

Check the condition of the temperature indicator previously installed on the gear unit during commissioning.

Example:

Limit temperature exceeded

Limit temperature NOT exceeded

Also check that the temperature is not excessive around the gear unit's bearings.

- Check the oil levels with reference to the tables and diagrams given in Annexes 1 and 2.
- Check that there are no signs of lubricant leaks near to the gear unit.
- **If any anomalies are found, identify their cause, repair the unit accordingly and top up the lubricant before putting the gear unit back into service.**

Every 3000 h of operation:

- For gear units with torque arm, check that the polymer bushings are not aged or damaged. If they are at all compromised, replace with original spare parts.

Every 5000 h of operation:

- Change the synthetic oil and bearing grease if the gear unit is not life-time lubricated.
- Replace all externally accessible seal rings unless this has already been done as a result of problems occurring before the scheduled maintenance deadline.

Every 5000 h of operation at rated torque:

(The minimum overhaul interval indicated here may increase considerably depending on actual conditions of service; see table (A5)).

- Overhaul the gear unit, unless this has already been done as a result of problems occurring before the specified deadline.

(An overhaul involves the replacement of bearings and/or other mechanical components which have worn to such an extent as to compromise the operation of the gear unit).

(A5)

$\frac{M_{n2}}{M_{r2}}$	**Interval hours**
1.0	5000
1.25	10000
1.5	17000
1.75	27000
2.0	40000

M_{n2} = nominal torque at output shaft

M_{r2} = required torque at output shaft

8.2 - LUBRICANTS

Before putting the gear unit into service, check the oil level. This must be done with the gear unit in the mounting position in which it will be used in the application. If necessary, if or top up the lubricant to the filling mark on the level cap which may be transparent or of the spill type.

Life-time lubricated gear units which are not subject to external contamination do not normally require periodic lubricant changes.

Do not mix oils of different nature or specifications and check that the oil is highly resistant to foaming and is EP rated.

If the same type of oil as that already in use is not available, drain the gear unit completely and flush its interior thoroughly with a light solvent before refilling with a new lubricant.

8.3 - OIL CHANGE

1. Place an adequate container under the drain plug.
2. Remove the filler and drain plugs and allow the oil to drain out.

The oil will drain better if it is warm.

3. Wait for a few minutes until all the oil has drained out, then screw the drain plug back on with a new gasket.
4. Fill the gear unit with the new oil (in its actual mounting position) to the centre of the level plug.
5. Tighten down the filler plug after fitting a new gasket.

The gear unit may be supplied with or without lubricant, as specified by the User. The quantity of oil to be filled is specified in the Sales Catalogue. This specification is, however, approximate, and reference must always be made to the centre of the level plug, the placement of which depends on the mounting position specified in the order.

Lubricants, solvents and detergents are toxic/harmful to health:

- they may cause irritation in direct contact with the skin
- they may cause intoxication if inhaled
- they can be fatal if swallowed.

Handle them with care using suitable individual safety equipment. Do not dump into the environment and dispose of in compliance with applicable legislation.

If a leak is found, identify the cause of the fault, repair it and refill with lubricant before operating the gear unit.

8.4 - RECOMMENDED/PERMITTED OILS

OILS AND GREASES COMPATIBLE with Atex-certified gear units

Greases:

- Klüber Asonic GHY 72 (for bearings)
- Shell TVX Compound B (for greased gear trains)
- Shell Tivela GL 00 (alternative for greased gear trains)
- Klüberpaste 46 MR 401 (to facilitate coupling of cylindrical parts)
- ITP Fluorocarbon gel 880 (for greasing contact seals)

Oils (as alternatives to Shell Tivela Oil S 320):

- Shell: Tivela Oil SC320
- Aral: Degol GS 320
- IP: Telium Oil VSF 320 (o Agip)
- Klüber: Klübersynth GH 6 320
- Total: Carter SY 320
- Mobil: Glygoyle HE 320

		C	S	F	A	A	VF	VF R	VF_L	VF-EP	V		VR
		11…100	10…50	10…90	70...90	10…60	W	W R	W_L	W-EP	0.25-0.5	1…10	0.25…10
Shell	Tivela S 220												
	Tivela S 320												
	Tivela S 460												
	Donax TX												
	Donax TA												
	Cassida Fluid WG 460	F	F	F	F	F	F	F		F			
	Cassida Fluid HF 46										F	F	
	TVX Compound B							G					G
Agip	Telium VSF 220												
	Telium VSF 320												
Esso	Spartan EP 220												
	Spartan EP 320												
Klüber	Klübersynth GH 6 220												
	Klübersynth GH 6 320												
	Klübersynth UH1 6-460	F	F	F	F	F	F	F		F			
Mobil	Glygoyle HE 320												
	Glygoyle HE 460												
	Mobilgear SHC XMP 220												
	Mobilgear SHC XMP 320												
	Mobil SHC 630												
	Mobil SHC 632												
	DTE FM 460												
Castrol	Alphasyn PG 220												
	Alphasyn PG 320												
Total	Carter SY 220												
	Carter SY 320												
	Carter SY 460												
Aral	Degol GS 220												
	Degol GS 320												
	Degol PAS 220												
Texaco	Synlube CLP 220												
	Synlube CLP 320												
Fuchs	Renoling PG 220												
	Renoling PG 320												

G = Grease
F = Food grade

Recommended
Permitted

8.5 - CHECKING EFFICIENCY

- Remove dust deposits from the gear unit and motor casings.
- Check that noise at constant load does not vary. Excessive vibration or noise can indicate wear of the gear train or failure of a bearing.
- Check the power absorption and voltage against the nominal values given on the motor's nameplate.
- Check the wear of linings on the brake motor (if used) and, if necessary, adjust the gap.
- Check for lubricant leaks from the gaskets/seals, caps and casings.
- Check all bolted couplings for wear, deformation or corrosion and tighten them down fully without overtightening.

8.6 - CLEANING

Clean all dust and process waste off the gear unit. Do not use solvents or other products which are incompatible with the construction material and do not direct high-pressure jets of water at the gear unit.

8.7 - PAINT COATING

In the factory, the cast-iron casing of the gear unit is magnetised and sprayed with polyester heat-setting resin which is then baked on. Aluminium casings are not paint coated.
Table (A6) shows in colour the types and gear frame sizes of gear units which are generally painted.

(A6)

C 05	C 11	C 21	C 31	C 35	C 41	C 51	C 61	C 70	C 80	C 90	C 100
A 10	A 20	A 30	A 41	A 50	A 60	A 70	A 80	A 90			
F 10	F 20	F 30	F 40	F 50	F 60	F 70	F 80	F 90			
S 10	S 20	S 30	S 40	S 50							
VF 27	VF 30	VF 44	VF 49	VF 130	VF 150	VF 185	VF 210	VF 250			
W 63	W 75	W 86	W 110								

If the gear unit is to be painted, tape the nameplate and seal rings to prevent contact with solvent.

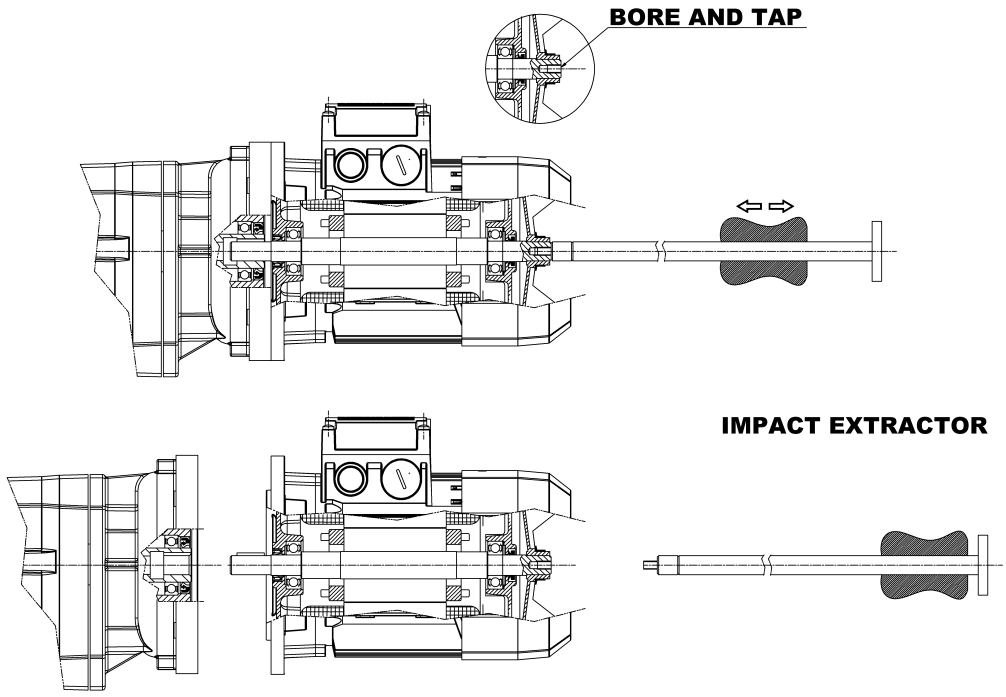
9.0 - REPLACING PARTS

- Do not hesitate to replace parts and/or components if they are not able to guarantee safe and reliable operation.
- Never improvise repairs.
- The use of non-original spare parts not only voids the warranty but can compromise gear unit operation.

9.1 - TAKING APART OF THE IEC-STANDARD FLANGED MOTOR

If, during operation, the coupling area of the motor and gear unit has not rusted significantly, it should be possible to remove the motor without applying excessive force.
If, on the other hand, it proves difficult to remove the motor, do not use screwdrivers or levers to apply force as this can damage the flanges and coupling surfaces, but proceed as indicated below.

(S3)



1. Drill and thread the motor shaft (fan side).
2. Screw an impact extractor tool into the tap.
3. Undo the screws fixing the motor to the gear unit.
4. Remove the motor by means of the inertial force of the extractor.

9.2 - SCRAPPING THE GEAR UNIT

This must only be done by operators trained in the observance of applicable laws on health and safety at work.
Do not dump non-biodegradable products, lubricants and non-ferrous materials (rubber, PVC, resins, etc.) into the environment. Dispose of all such materials as stipulated by applicable environmental protection legislation.

Do not attempt to re-use parts or components which appear to be in good condition after they have been checked and/or replaced by qualified personnel and declared unsuitable for use.

10.0 - TROUBLESHOOTING

The following information is intended to serve as an aid in identifying and correcting defects and faults. In some cases, such problems may be caused by the plant or machine onto which the gear unit is assembled, and hence, the cause and eventual solution can be found in the Manufacturer's technical documentation for the machine/plant in question.

PROBLEM	CAUSE	SOLUTION
Bearing temperature too high	Oil level too low	Top up oil level
	Oil too old	Replace oil
	Defective bearings	Contact authorised workshop
Operating temperature too high	Oil level too high	Check oil level
	Oil too old	Replace oil
	Impurities in oil	Replace oil
Abnormal running noise	Gears damaged	Contact authorised workshop
	Bearing axial backlash too high	Contact authorised workshop
	Bearings defective or worn	Contact authorised workshop
	Service load too high	Correct service load to nominal values given in Sales Catalogue
	Impurities in oil	Replace oil
Abnormal noise at gear unit mounting	Mounting bolts loose	Tighten down to specified torque
	Mounting bolts worn	Replace bolts
Oil leaks	Oil level too high	Check oil level
	Casing/coupling seals inadequate	Contact authorised workshop
	Gaskets worn	Contact authorised workshop
Gear unit does not run or runs with difficulty	Oil viscosity too high	Replace oil (see table of recommended lubricants)
	Oil level too high	Check oil level
	Service load too high	Redesign drive for actual service load
Output shaft does not turn with motor running	Gears damaged	Contact authorised workshop

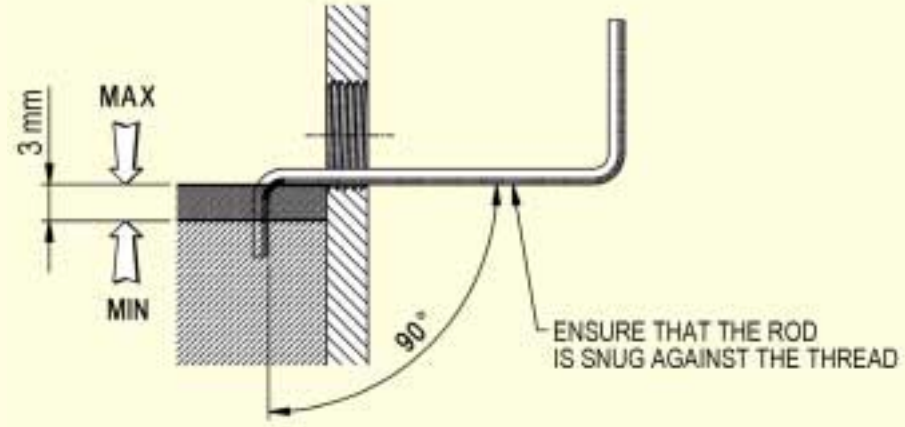
ANNEX 1 - CHECKING OIL LEVEL ON ATEX-SPECIFIED GEAR UNITS

Gear units are normally supplied with a yellow oil level plug of the spill type.

To check the oil level, first identify the yellow level plug.

Remove the plug and insert a bar of the right size for the hole and of the shape shown in the figure below.

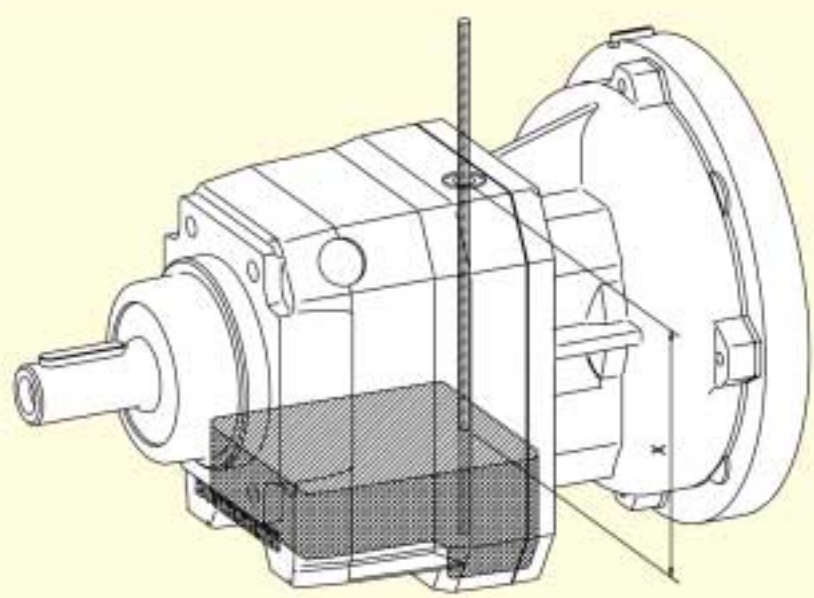
If the level is more than 3 mm below the overflow level, top up and check the reason for the drop in oil level.



Helical in-line gear units C11, C21 and C31 (all mounting positions) and bevel helical gear units A10, A20 and A30 in mounting positions B6 and B7 only do not feature a level plug. The oil level must therefore be checked, not as described above, but via a hole provided for the purpose in the manner described hereafter.

Helical in-line gear units C 11, C 21, C 31

(S4)



(A7)

	P						F						U-UF					
	B3	**B6**	**B7**	**B8**	**V5**	**V6**	**B5**	**B51**	**B53**	**B52**	**V1**	**V3**	**B5**	**B51**	**B53**	**B52**	**V1**	**V3**
C 11 2_ P63-P71	70	70	70	70	70	45	70	70	70	70	60	30	70	70	70	70	60	30
C 11 2_ P80...P112	75	75	75	75	75	45	75	75	75	75	70	30	75	75	75	75	70	30
C 21 2_ P63-P71, HS	70	70	70	70	70	40	70	70	70	70	70	45	70	70	70	70	70	45
C 21 2_ P80...P112	75	75	75	75	75	40	75	75	75	75	75	45	75	75	75	75	75	45
C 21 3_ P63-P71	50	50	50	50	50	30	50	50	50	50	50	30	50	50	50	50	50	30
C 21 3_ P80...P112	55	55	55	55	55	30	55	55	55	55	55	30	55	55	55	55	55	30
C 31 2_ P63...P112, HS	65	65	65	65	60	60	65	65	65	65	55	55	65	65	65	65	55	55
C 31 3_ P63...P112	55	55	55	55	55	55	55	55	55	55	55	55	55	55	55	55	55	55

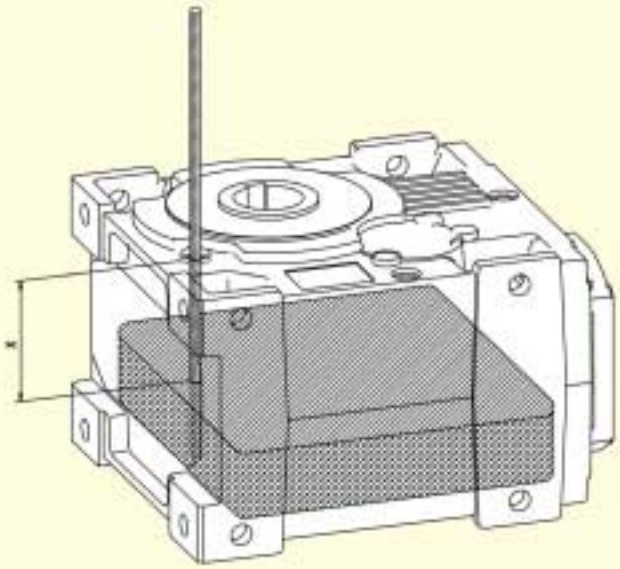
Values in the table are given in mm.

To check the oil level, proceed as follows:

1. Place the gear unit in the mounting position as shown in diagram (S4).
2. Insert a dipstick through the yellow service cap (on top of the gear unit) until it touches the floor of the casing. Mark the level of the upper surface of the casing on the dipstick in this position.
3. Extract the dipstick and measure the distance **X** shown in diagram (S4) above.
4. The value **X** must be **less than** the value given in table (A7).

Bevel helical gear units A 10, A 20 and A 30 - Mounting positions B6 and B7

(S5)



(A8)

	B6	B7
A 10_ P63...P112	30	30
A 20_ P63...P112, HS	25	25
A 30_ P63...P112, HS	30	30

Values in the table are given in mm

To check the oil level, proceed as follows:

1. Place the gear unit in the mounting position as shown in diagram (S5).
2. Insert a dipstick through the yellow service cap (on top of the gear unit) until it touches the floor of the casing. Mark the level of the upper surface of the casing on the dipstick in this position.
3. Extract the dipstick and measure the distance **X** shown in diagram (S5) above.
4. The value **X** must be **less than** the value given in table (A8).

ANNEX 2 - LUBRICANT FILL QUANTITY

Helical in-line gear units, series C:

(A9)

	oil [l]																	
	P						F						U - UF					
	B3	B6	B7	B8	V5	V6	B5	B51	B53	B52	V1	V3	B5	B51	B53	B52	V1	V3
C 05 2	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	-	-	-	-	-	-
C 11 2	0.45	0.45	0.45	0.45	0.50	0.60	0.40	0.40	0.50	0.50	0.50	0.60	0.40	0.40	0.50	0.50	0.50	0.60
C 21 2	0.80	0.80	0.80	0.80	0.85	1.1	0.75	0.75	0.75	0.75	0.80	1.0	0.75	0.75	0.75	0.75	0.80	1.0
C 21 3	1.2	1.2	1.2	1.2	1.3	1.4	1.2	1.2	1.2	1.2	1.3	1.4	1.2	1.2	1.2	1.2	1.3	1.4
C 31 2	1.4	1.4	1.4	1.4	1.5	1.5	1.3	1.3	1.3	1.3	1.5	1.5	1.3	1.3	1.3	1.3	1.5	1.5
C 31 3	1.6	1.6	1.6	1.6	1.8	1.8	1.6	1.6	1.6	1.6	1.8	1.8	1.6	1.6	1.6	1.6	1.8	1.8
C 35 2	1.6	1.5	1.5	1.3	2.1	2.4	-	-	-	-	-	-	1.6	1.5	1.5	1.3	2.1	2.4
C 35 3	1.5	1.4	1.5	1.3	2.0	2.3	-	-	-	-	-	-	1.5	1.4	1.5	1.3	2.0	2.3
C 35 4	2.3	2.1	2.3	2.1	2.7	3.1	-	-	-	-	-	-	2.3	2.1	2.3	2.1	2.7	3.1
C 41 2	2.2	2.0	2.1	1.9	2.7	3.4	-	-	-	-	-	-	2.2	2.0	2.1	1.9	2.7	3.4
C 41 3	2.1	1.9	2.1	1.9	2.6	3.2	-	-	-	-	-	-	2.1	1.9	2.1	1.9	2.6	3.2
C 41 4	2.8	2.6	2.8	2.6	3.5	3.9	-	-	-	-	-	-	2.8	2.6	2.8	2.6	3.5	3.9
C 51 2	3.1	3.0	3.1	3.0	4.3	5.0	-	-	-	-	-	-	3.1	3.0	3.1	3.0	4.3	5.0
C 51 3	3.0	2.8	3.1	3.0	4.1	4.9	-	-	-	-	-	-	3.0	2.8	3.1	3.0	4.1	4.9
C 51 4	4.3	4.1	4.4	4.2	5.4	6.1	-	-	-	-	-	-	4.3	4.1	4.4	4.2	5.4	6.1
C 61 2	4.2	4.0	4.2	4.1	6.0	6.7	-	-	-	-	-	-	4.2	4.0	4.2	4.1	6.0	6.7
C 61 3	4.2	4.0	4.2	4.1	6.0	6.7	-	-	-	-	-	-	4.2	4.0	4.2	4.1	6.0	6.7
C 61 4	6.1	5.9	6.1	6.0	7.9	8.6	-	-	-	-	-	-	6.1	5.9	6.1	6.0	7.9	8.6
C 70 2	6.5	8.5	8.5	7.5	11	7.5	6.5	8.5	8.5	7.5	11	7.5	-	-	-	-	-	-
C 70 3	6.5	8.5	8.5	7.5	11	7.5	6.5	8.5	8.5	7.5	11	7.5	-	-	-	-	-	-
C 70 4	6.5	8.5	8.5	7.5	11	8.0	6.5	8.5	8.5	7.5	11	7.5	-	-	-	-	-	-
C 80 2	11	14	14	13	18	13	11	14	14	13	18	13	-	-	-	-	-	-
C 80 3	11	14	14	13	18	13	11	14	14	13	18	13	-	-	-	-	-	-
C 80 4	11	14	14	13	18	13	11	14	14	13	18	13	-	-	-	-	-	-
C 90 2	19	25	25	22	31	22	19	25	25	22	31	22	-	-	-	-	-	-
C 90 3	19	25	25	22	31	22	19	25	25	22	31	22	-	-	-	-	-	-
C 90 4	19	25	25	22	31	22	19	25	25	22	31	22	-	-	-	-	-	-
C 100 2	27	37	37	33	45	33	27	37	37	33	45	33	-	-	-	-	-	-
C 100 3	27	37	37	33	45	33	27	37	37	33	45	33	-	-	-	-	-	-
C 100 4	27	37	37	33	45	33	27	37	37	33	45	33	-	-	-	-	-	-

Life-time lubricated gear units.

Life-time lubricated gear units only in combination with ATEX variants.

Lubricant is not factory filled.

Bevel helical gear units, series A:

(A10)

	oil [l]					
	B3	B6	B7	B8	VA	VB
A 10 2	1.4	1.4	1.4	1.4	1.4	1.4
A 20 2	2.3	2.3	2.3	2.3	2.3	2.3
A 20 3	2.6	2.6	2.6	2.6	2.6	2.6
A 30 2	3.2	3.2	3.2	3.2	3.2	3.2
A 30 3	3.6	3.6	3.6	3.6	3.6	3.6
A 41 2	4.0	4.1	4.1	4.7	5.2	4.4
A 41 3	4.0	4.0	4.0	4.7	6.1	3.9
A 50 2	4.9	8.1	4.7	8.4	11	9.2
A 50 3	5.1	8.1	4.7	8.4	11	9.2
A 50 4	6.3	8.2	5.3	8.3	13	9.1
A 60 2	6.8	8.1	12	15	18	15
A 60 3	6.8	8.1	12	15	18	15
A 60 4	7.2	11	7.4	16	19	14
A 70 3	10	14	10	15	20	14
A 70 4	13	14	10	15	23	14
A 80 3	15	22	15	26	35	22
A 80 4	20	22	15	26	39	22
A 90 3	31	35	37	44	66	39
A 90 4	41	35	37	44	73	39

(A11)

	oil [l]					
	B3	B6	B7	B8	VA	VB
A 10 2	0.80	see Annex 1	see Annex 1	1.2	1.2	1.1
A 20 2	1.2			1.7	1.8	1.5
A 20 3	1.5			1.7	2.4	1.6
A 30 2	1.8			2.3	2.6	2.1
A 30 3	2.3			2.4	3.5	2.3
A 41 2	4.0	4.1	4.1	4.7	5.2	4.4
A 41 3	4.0	4.0	4.0	4.7	6.1	3.9
A 50 2	4.9	8.1	4.7	8.4	11	9.2
A 50 3	5.1	8.1	4.7	8.4	11	9.2
A 50 4	6.3	8.2	5.3	8.3	13	9.1
A 60 2	6.8	8.1	12	15	18	15
A 60 3	6.8	8.1	12	15	18	15
A 60 4	7.2	11	7.4	16	19	14

Life-time lubricated gear units.

Lubricant is not factory filled.

Shaft-mounted gear units, series F:

(A12)

	oil [l]					
	H1	H2	H3	H4	H5	H6
F 10 2	0.95	0.95	0.95	0.95	0.95	0.95
F 20 2	1.4	1.4	1.4	1.4	1.4	1.4
F 20 3	1.8	1.8	1.8	1.8	1.8	1.8
F 30 2	2.6	2.1	1.5	2.1	2.9	2.1
F 30 3	2.6	2.1	1.5	2.1	2.9	2.1
F 30 4	2.9	2.4	1.7	2.4	3.2	2.4
F 40 2	5.0	3.9	4.0	3.1	5.1	4.0
F 40 3	5.0	3.9	4.0	3.1	5.1	4.0
F 40 4	5.3	4.3	4.3	3.3	5.5	4.4
F 50 2	9.2	6.7	7.6	4.7	9.2	6.7
F 50 3	9.2	6.7	7.6	4.7	9.2	6.7
F 50 4	9.7	7.4	8.1	5.1	9.9	7.4
F 60 3	14	10	7.4	10	14	10
F 60 4	15	12	8.0	11	15	11
F 70 3	23	20	9.7	16	24	19
F 70 4	23	20	9.7	16	27	19
F 80 3	40	34	16	29	42	31
F 80 4	40	34	16	29	48	31
F 90 3	71	59	32	49	76	55
F 90 4	71	59	32	49	86	55

(A13)

	oil [l]					
	H1	H2	H3	H4	H5	H6
F 10 2	1.2	1.3	0.70	0.80	0.80	1.1
F 20 2	2.0	1.7	0.90	1.3	1.2	1.7
F 20 3	2.3	1.8	1.2	1.5	1.8	1.8
F 30 2	2.6	2.6	1.5	1.7	2.5	2.6
F 30 3	2.5	2.5	1.5	1.6	2.4	2.5
F 30 4	3.0	2.7	1.9	2.0	3.3	2.7
F 40 2	5.5	4.4	4.5	3.6	5.6	4.9
F 40 3	5.5	4.4	4.5	3.6	5.6	4.9
F 40 4	5.3	4.3	4.3	3.3	5.5	4.4
F 50 2	9.7	7.2	8.1	5.2	9.7	7.6
F 50 3	9.7	7.2	8.1	5.2	9.7	7.6
F 50 4	9.7	7.4	8.1	5.1	9.9	7.4
F 60 3	14	11	7.9	11	15	11
F 60 4	15	12	8.0	11	15	11

Life-time lubricated gear units.

Lubricant is not factory filled.

Worm gear units, series VF:

(A14)

			oil [l]					
			B3	B6	B7	B8	V5	V6
VF 27	N - A - V - F	HS - P(IEC)	0.025	0.025	0.025	0.025	0.025	0.025
VF 30	N - A - V - F - P	HS - P(IEC)	0.045	0.045	0.045	0.045	0.045	0.045
VF 44	N - A - V - F - FA - P	HS - P(IEC)	0.075	0.075	0.075	0.075	0.075	0.075
VFR 44	N - A - V - F - FA - P	P(IEC)	0.050	0.050	0.050	0.050	0.050	0.050
VF 49	N - A - V - F - FA - P	HS - P(IEC)	0.12	0.12	0.12	0.12	0.12	0.12
VFR 49	N - A - V - F - FA - P	HS - P(IEC)	0.065	0.065	0.065	0.065	0.065	0.065
VF 130	N	HS - P(IEC)	2.3	2.5	2.5	3.0	3.2	3.4
VFR 130	N	HS - P(IEC)	0.70	0.50	0.50	0.40	0.40	0.50
VF 130	V	HS - P(IEC)	3.4	2.5	2.5	3.1	3.0	2.5
VFR 130	V	HS - P(IEC)	0.50	0.50	0.50	0.40	0.40	0.70
VF 130	A - F - FC - FR - P	HS	3.9	2.5	2.5	2.3	3.3	3.3
VF 130	A - F - FC - FR - P	P(IEC)	3.0	2.5	2.5	2.3	3.3	3.3
VFR 130	A - F - FC - FR - P	HS - P(IEC)	0.40	0.50	0.50	0.70	0.40	0.50
VF 150	N	HS - P(IEC)	3.0	3.5	3.5	4.3	3.8	4.0
VFR 150	N	HS - P(IEC)	1.0	0.80	0.80	0.60	0.40	1.0
VF 150	V	HS - P(IEC)	4.0	3.5	3.5	3.6	4.3	3.0
VFR 150	V	HS - P(IEC)	1.0	0.80	0.80	0.40	0.60	1.0
VF 150	A - F - FC - FR - P	HS	4.5	3.5	3.5	3.0	3.9	3.9
VF 150	A - F - FC - FR - P	P(IEC)	4.3	3.5	3.5	3.0	3.9	3.9
VFR 150	A - F - FC - FR - P	HS - P(IEC)	0.60	0.80	0.80	1.0	0.40	1.0
VF 185	N	HS - P(IEC)	5.0	5.5	5.5	7.8	6.6	6.8
VFR 185	N	HS - P(IEC)	1.0	0.80	0.80	0.60	0.40	1.0
VF 185	V	HS - P(IEC)	6.8	5.5	5.5	6.4	7.8	5.4
VFR 185	V	HS - P(IEC)	1.0	0.80	0.80	0.40	0.60	1.0
VF 185	A - F - FC - FR - P	HS	9.6	5.5	5.5	5.0	6.7	6.7
VF 185	A - F - FC - FR - P	P(IEC)	7.8	5.5	5.5	5.0	6.7	6.7
VFR 185	A - F - FC - FR - P	HS - P(IEC)	0.60	0.80	0.80	1.0	0.40	1.0
VF 210	N	HS - P(IEC)	7.5	9.5	9.5	7.3	9.2	9.0
VFR 210	N	HS - P(IEC)	1.3	1.1	1.1	0.80	0.70	1.3
VF 210	V	HS - P(IEC)	8.9	9.5	9.5	7.3	11	8.0
VFR 210	V	HS - P(IEC)	1.3	1.1	1.1	0.60	0.90	1.3
VF 210	A - F - FC - FR - P	HS	15	9.5	9.5	7.5	9.4	8.9
VF 210	A - F - FC - FR - P	P(IEC)	11	9.5	9.5	7.5	9.4	8.9
VFR 210	A - F - FC - FR - P	HS - P(IEC)	0.80	1.1	1.1	1.3	0.70	1.3
VF 250	N	HS - P(IEC)	11	17	17	11	17	17
VFR 250	N	HS - P(IEC)	1.3	1.1	1.1	0.80	0.70	1.3
VF 250	V	HS - P(IEC)	17	17	17	11	23	11
VFR 250	V	HS - P(IEC)	1.3	1.1	1.1	0.60	0.90	1.3
VF 250	A - F - FC - FR - P	HS	28	17	17	11	18	17
VF 250	A - F - FC - FR - P	P(IEC)	23	17	17	11	18	17
VFR 250	A - F - FC - FR - P	HS - P(IEC)	0.80	1.1	1.1	1.3	0.70	1.3

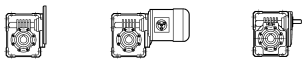
VF permanent lubrication.

VFR permanent lubrication.

For VFR units the lubricant charge refers only to the additional helical reduction.

Worm gear units, series W:

(A15)

				oil [l]						
				B3	B6	B7	B8	V5	V6	R
W 63	i = 7, 10, 12, 15			0.31	0.31	0.31	0.31	0.31	0.31	0.15
	i = 19, 24, 30, 38, 45, 64, 80, 100			0.38	0.38	0.38	0.38	0.38	0.38	
W 75	i = 7, 10, 15			0.48	0.48	0.48	0.48	0.48	0.48	0.25
	i = 30, 40			0.52	0.52	0.52	0.52	0.52	0.52	
	i = 20, 25, 50, 60, 80, 100			0.56	0.56	0.56	0.56	0.56	0.56	
W 86	i = 7, 10, 15			0.64	0.64	0.64	0.64	0.64	0.64	0.25
	i = 30			0.73	0.73	0.73	0.73	0.73	0.73	
	i = 20, 23, 40, 46, 56 ,64, 80, 100			0.90	0.90	0.90	0.90	0.90	0.90	
				B3	B6	B7	B8	V5	V6	R
W 110	P80…P132	-	-	1.5	1.7	1.7	1.9	1.7	1.6	0.40
	-	M2 – M3	-	1.5	1.7	1.7	1.9	1.7	1.6	
	-	-	$7 \leq i \leq 15$	1.5	1.7	1.7	1.9	1.7	1.6	
			$20 \leq i \leq 100$	2.7	1.7	1.7	1.9	1.7	1.6	

Life-time lubricated gear units.

Life-time lubricated gear units only in combination with ATEX variants.

Lubricant is not factory filled.

Single-stage helical gear units, series S:

(A16)

	oil [l]											
	P						F					
	B3	B6	B7	B8	V5	V6	B5	B51	B52	B53	V1	V3
S 10 1	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30
S 20 1	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45
S 30 1	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70
S 40 1	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6
S 50 1	1.7	2.2	2.2	3.0	3.0	2.0	1.7	1.7	1.7	1.7	3.0	2.0

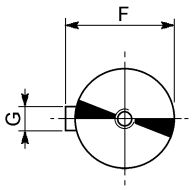
Life-time lubricated gear units.

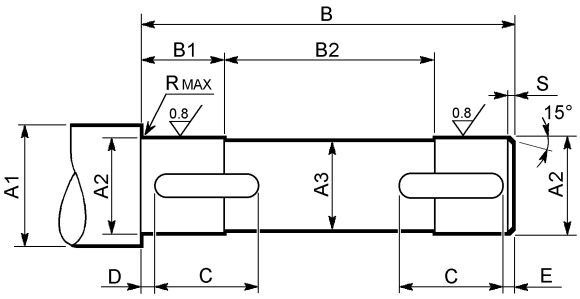
Lubricant is not factory filled.

ANNEX 3 - CUSTOMER'S SHAFT

Series A

NH_
UH_

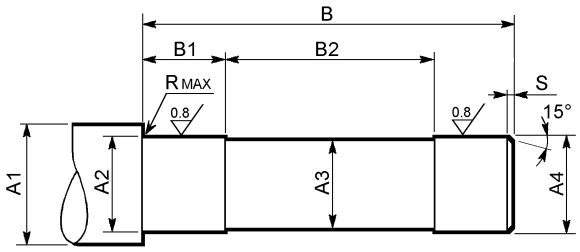




(A17)

	A1	A2	A3	B	B1	B2	C	D	E	F	G	R	S	UNI 6604
A 10	≥ 35	30 h7	29	118	16	87	20	2	2	33	8 h9	0.5	1.5	8x7x20 A
	≥ 30	25 h7	24	118	16	87	20	2	2	28	8 h9	0.5	1.5	8x7x20 A
A 20	≥ 42	35 h7	34	138	20	98	20	2	2	38	10 h9	0.5	1.5	10x8x20 A
	≥ 35	30 h7	29	138	20	98	25	2	2	33	8 h9	0.5	1.5	8x7x25 A
A 30	≥ 47	40 h7	39	158	23	112	30	2	2	43	12 h9	0.5	1.5	12x8x30 A
	≥ 42	35 h7	34	158	23	112	30	2	2	38	10 h9	0.5	1.5	10x8x30 A
A 41	≥ 52	45 h7	44	184	28	128	45	2.5	2.5	49.5	14 h9	1	2	14x9x45 A
	≥ 47	40 h7	39	184	28	128	50	2.5	2.5	43	12 h9	1	2	12x8x50 A
A 50	≥ 63	55 h7	54	226	37.5	151	55	2.5	2.5	59	16 h9	1	2	16x10x55 A
	≥ 57	50 h7	49	226	37.5	151	65	2.5	2.5	53.5	14 h9	1	2	14x9x65 A
A 60	≥ 78	70 h7	69	248	48	152	70	2.5	2.5	74.5	20 h9	2.5	2	20x12x70 A
	≥ 68	60 h7	59	248	48	152	80	2.5	2.5	64	18 h9	2.5	2	18x11x80 A
A 70	≥ 89	80 h7	79	303	58	187	90	3	3	85	22 h9	2.5	2.5	22x14x90 A
	≥ 78	70 h7	69	303	58	187	110	3	3	74.5	20 h9	2.5	2.5	20x12x110 A
A 80	≥ 99	90 h7	89	358	78	202	120	3	3	95	25 h9	2.5	2.5	25x14x120 A
	≥ 89	80 h7	79	358	78	202	130	3	3	85	22 h9	2.5	2.5	22x14x130 A
A 90	≥ 111	100 h7	99	408	78	252	160	3	3	106	28 h9	2.5	2.5	28x16x160 A
	≥ 99	90 h7	89	408	78	252	190	3	3	95	25 h9	2.5	2.5	25x14x190 A

US

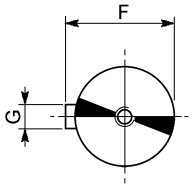


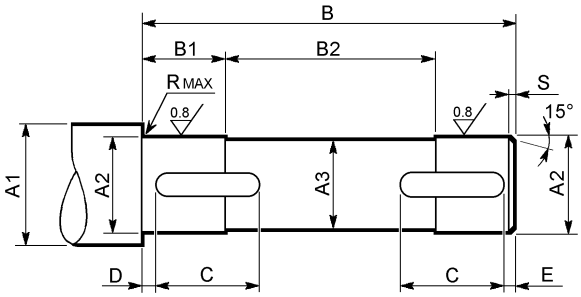
(A18)

	A1	A2	A3	A4	B	B1	B2	R	S
A 10	≥ 42	32 h7	29	30 h6	147.5	34	77.5	0.5	1.5
A 20	≥ 48	37 h7	34	35 h6	170	40	89	0.5	1.5
A 30	≥ 54	42 h7	39	40 h6	191.5	48	95.5	0.5	1.5
A 41	≥ 60	47 h7	44	45 h6	222	53	117	1	2
A 50	≥ 72	57 h7	54	55 g6	264	46	156	1	2
A 60	≥ 90	72 h7	69	70 g6	293	48	178	2.5	2.5
A 70	≥ 104	82 h7	79	80 g6	352.5	90	172.5	2.5	2.5
A 80	≥ 114	92 h7	89	90 g6	416	100	216	2.5	2.5
A 90	≥ 126	102 h7	99	100 g6	469	78	321	2.5	2.5

Series F

H

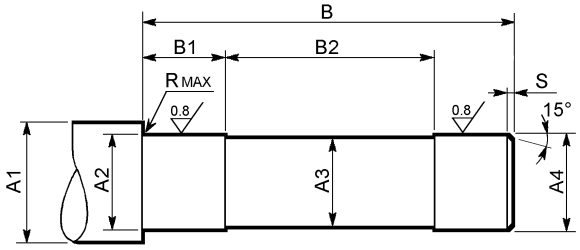




(A19)

	A1	A2	A3	B	B1	B2	C	D	E	F	G	R	S	UNI 6604
F 10	≥ 35	30 h7	29	79	15.5	48	20	2	2	33	8 h9	0.5	1.5	8x7x20 A
	≥ 30	25 h7	24	79	15.5	48	20	2	2	28	8 h9	0.5	1.5	8x7x20 A
F 20	≥ 42	35 h7	34	99	18	63	22	2	2	38	10 h9	0.5	1.5	10x8x22 A
	≥ 35	30 h7	29	99	18	63	22	2	2	33	8 h9	0.5	1.5	8x7x22 A
F 30	≥ 47	40 h7	39	104	28	48	30	2	2	43	12 h9	0.5	1.5	12x8x30 A
	≥ 42	35 h7	34	104	28	48	30	2	2	38	10 h9	0.5	1.5	10x8x30 A
F 40	≥ 52	45 h7	44	118	27.5	63	45	2.5	2.5	49.5	14 h9	1	2.0	14x9x45 A
	≥ 47	40 h7	39	118	27.5	63	45	2.5	2.5	43	12 h9	1	2.0	12x8x45 A
F 50	≥ 63	55 h7	54	139	33	73	50	2.5	2.5	59	16 h9	1	2.0	16x10x50 A
	≥ 57	50 h7	49	139	33	73	50	2.5	2.5	53.5	14 h9	1	2.0	14x9x50 A
F 60	≥ 78	70 h7	69	180	38	104	70	2.5	2.5	74.5	20 h9	1	2.0	20x12x70 A
	≥ 68	60 h7	59	180	38	104	70	2.5	2.5	64	18 h9	1	2.0	18x11x70 A
F 70	≥ 89	80 h7	79	229	58	113	75	3	3	85	22 h9	2.5	2.5	22x14x75 A
	≥ 78	70 h7	69	229	58	113	75	3	3	74.5	20 h9	2.5	2.5	20x12x75 A
F 80	≥ 99	90 h7	89	272	78	116	100	3	3	95	25 h9	2.5	2.5	25x14x100 A
	≥ 89	80 h7	79	272	78	116	100	3	3	85	22 h9	2.5	2.5	22x14x100 A
F 90	≥ 111	100 h7	99	333	87.5	158	110	3	3	106	28 h9	2.5	2.5	28x16x110 A
	≥ 99	90 h7	89	333	87.5	158	110	3	3	95	25 h9	2.5	2.5	25x14x110 A

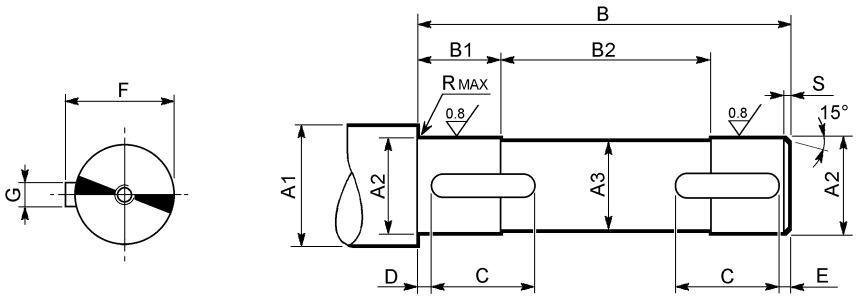
S



(A20)

	A1	A2	A3	A4	B	B1	B2	R	S
F 10	≥ 36	27 h7	24	25 h6	138	34	70	0.5	1.5
F 20	≥ 42	32 h7	29	30 h6	160	38	84	0.5	1.5
F 30	≥ 50	38 h7	35	36 h6	155	40	73	1	2
F 40	≥ 58	44 h7	41	42 h6	177	46.5	82	1	2
F 50	≥ 68	54 h7	51	52 g6	201	48	91	1	2
F 60	≥ 84	67 h7	64	65 g6	248	53	133	1.5	2
F 70	≥ 104	82 h7	79	80 g6	308	78	140	2.5	2.5
F 80	≥ 114	92 h7	89	90 g6	365	88	177	2.5	2.5
F 90	≥ 126	102 h7	99	100 g6	429.5	98	221.5	2.5	2.5

Series VF and W



(A21)

	A1	A2	A3	B	B1	B2	C	D	E	F	G	R	S	UNI 6604
VF 30	≥ 19	14 f7	13	53	18.5	16	40	6.5	6.5	16	5 h9	0.5	1.5	5x5x40 A
VF 44	≥ 23	18 f7	17	62	22.5	17	50	6	6	20.5	6 h9	0.5	1.5	6x6x50 A
VF 49	≥ 30	25 f7	24	80	20.5	39	20	2	2	28	8 h9	1	1.5	8x7x20 A
VF 130	≥ 52	45 f7	44	163	50.5	62	60	2.5	2.5	49.5	14 h9	2.5	2	14x9x60 A
VF 150	≥ 57	50 f7	49	173	53	67	70	2.5	2.5	53.5	14 h9	2.5	2	14x9x70 A
VF 185	≥ 68	60 f7	59	188	63	62	80	2.5	2.5	64	18 h9	2.5	2	18x11x80 A
VF 210	≥ 99	90 f7	89	258	83	92	80	3	3	95	25 h9	2.5	2.5	25x14x80 A
VF 250	≥ 121	110 h7	109	318	83	152	80	3	3	116	28 h9	2.5	2.5	28x16x80 A

(A22)

	A1	A2	A3	B	B1	B2	C	D	E	F	G	R	S	UNI 6604
W 63	≥ 30	25	24	118	38	42	35	2	2	28	8 h9	1	1.5	8x7x35 A
W 75	≥ 35	28	27	125	38	49	40	2	2	31	8 h9	1	1.5	8x7x40 A
	≥ 35	30	29	125	38	49	40	2	2	33	8 h9	1	1.5	8x7x40 A
W 86	≥ 42	35	34	138	43	52	40	2	2	38	10 h9	1.5	1.5	10x8x40 A
W 110	≥ 48	42	41	153	43	67	50	2.5	2.5	45	12 h9	1.5	2	12x8x50 A

ANNEX 4 - LIFTING

When lifting, use accessories such as eyebolts, snap hooks, screw clamps, straps, ropes, hooks etc. which are certified and adequate for the load.
The weight of the product to be lifted is given in the Sales Catalogue.

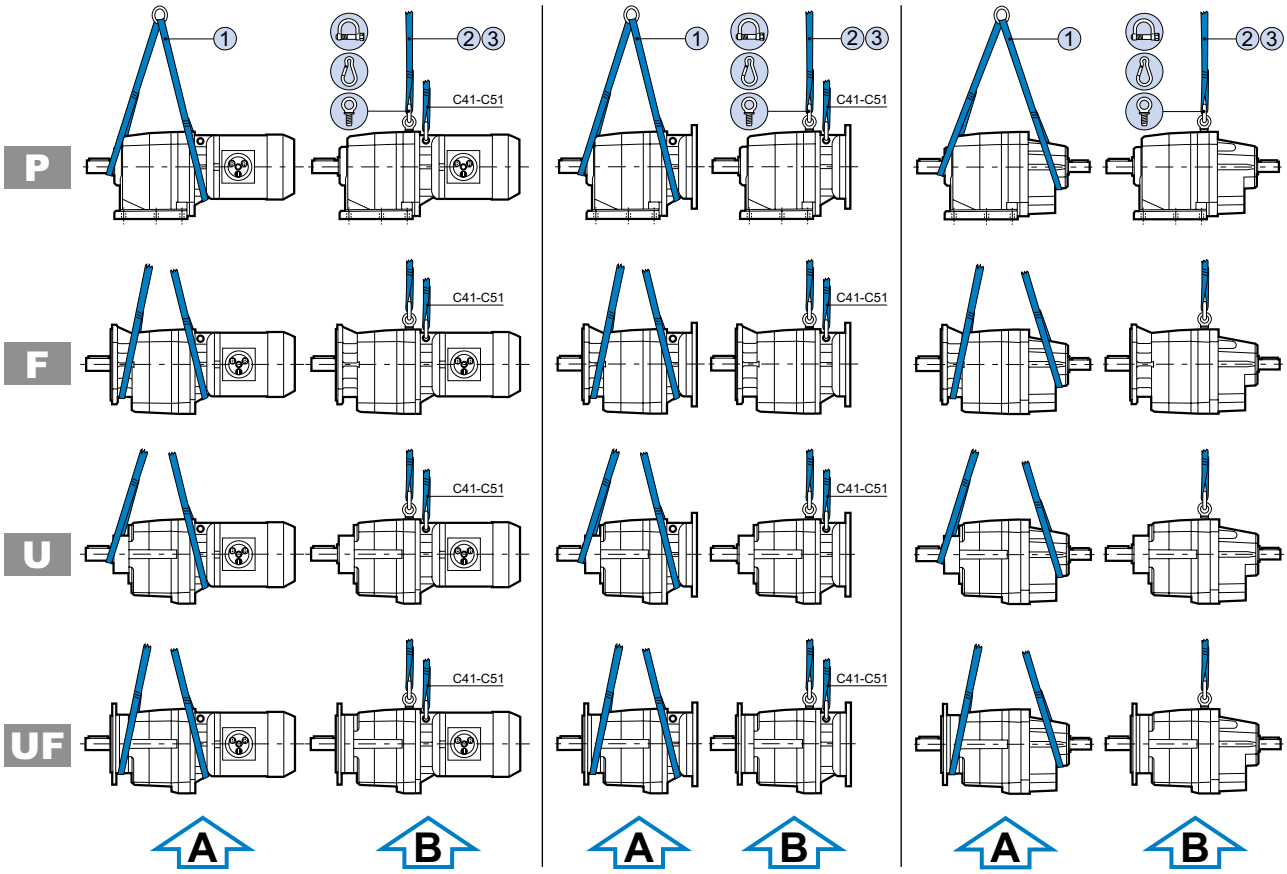
The method of attachment for the products covered by this Manual are detailed below according to the various product series, sizes and configurations.
The most suitable type of solution for safely lifting and handling each is indicated below.

Symbols:

Lifting method	**Manual**	**Through mechanical equipment**	
Simbol	**M**	**A**	**B**
Approximate weight	≤ 15 Kg	> 15 Kg	
Instruction	—	Recommended method for positioning	Recommended method for handling and positioning
Warning	—	The load may be unstable	The load may sway or oscillate.
Solution	—	Slide the lifting ring to align it with the load's centre of gravity as shown in the diagrams below Lock the ropes under the ring with a cable clamp or similar device so as to prevent them sliding, and lift the load Observe all precautions regarding the handling of loads	Stabilise the moving load by hand. Observe all precautions regarding the handling of loads

The load must not be allowed to sway or oscillate by more than 15° in any direction when being lifted.
If the oscillation exceeds this limit, stop and repeat the lifting operation as instructed.

Series C



	M05	M1	M2	M3	M4	M5	IEC	
C 05	M		—	—	—	—	—	—
C 11	M		A		—	—	M	M
C 21	M		A		—	—	M	M
C 31	M	A			—	—	M	M
C 35	A				—	—	A	A
C 41	A - B					—	A - B	A - B
C 51	—	A - B				—	A - B	A - B
C 61	—	A - B				A	A - B	A - B
C 70	—	A - B				A	A - B	A - B
C 80	—	A - B				A	A - B	A - B
C 90	—	A - B				A	A - B	A - B
C 100	—	A - B				A	A - B	A - B

① Ring harness

② Rope and hooks

③ Open harness with eyelets

Screw clamp (use with harness)

Snap hook (use with rope)

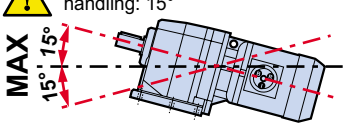
Eyebolt (already fitted to gear units C50...C100)

M Lift manually (weight ≤ 15 kg)

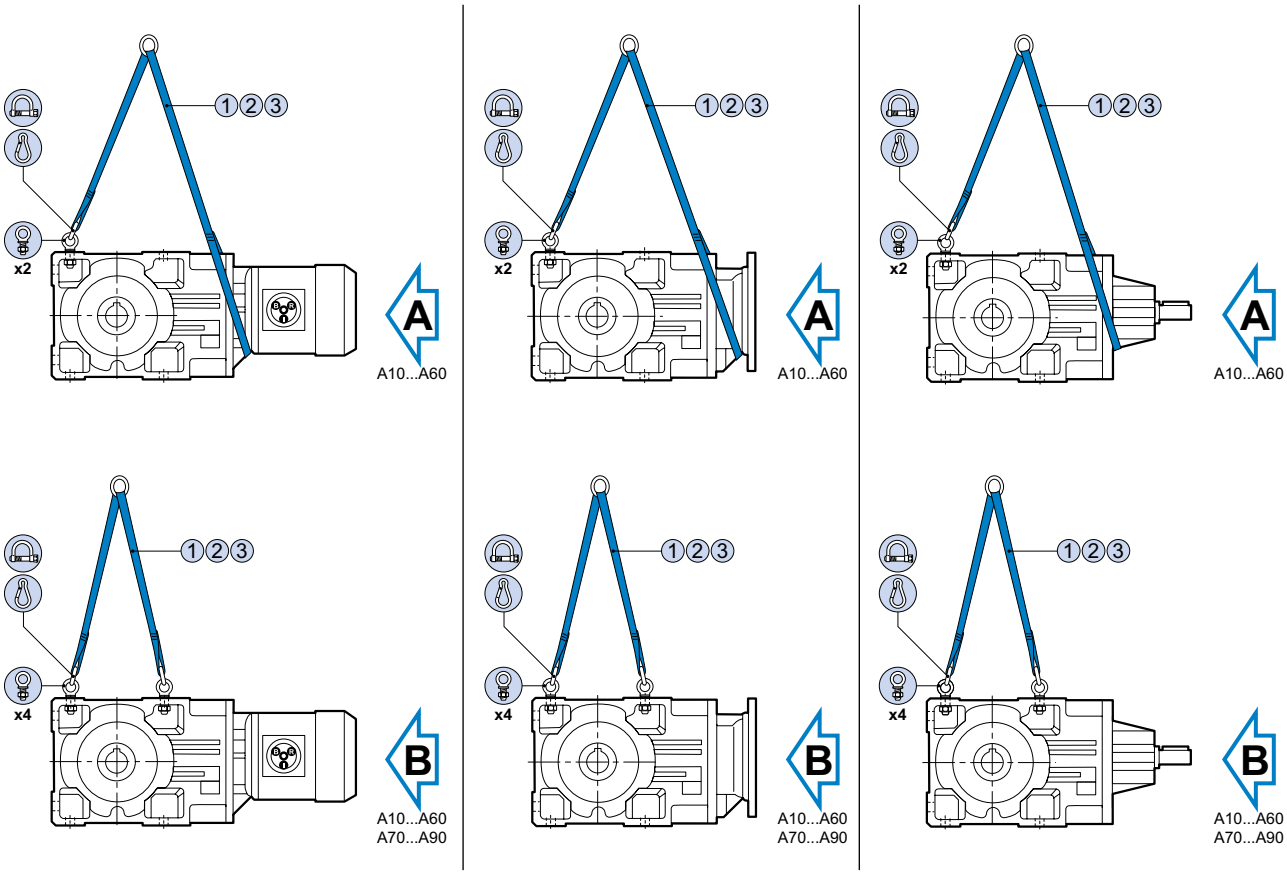
A Lift as per diagram A

B Lift as per diagram B

Maximum permissible tilt during handling: 15°



Series A



	M05	M1	M2	M3	M4	M5	IEC	
A 10	M		A		—	—	M	M
A 20	A - B				—	—	M (P63...P90) A - B (P100...P112)	M
A 30	A				—	—	A	A
A 41	A - B					—	A - B	A - B
A 50	—	A - B				—	A - B	A - B
A 60	—	B					A - B	A - B
A 70	—	B					B	B
A 80	—	B					B	B
A 90	—	B					B	B

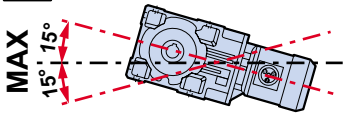
Reccomended:
solution A for positioning; solution B for positioning and handling.

① Ring harness
② Rope and hooks
③ Open harness with eyelets

Screw clamp (use with harness)
Snap hook (use with rope)
Eyebolt

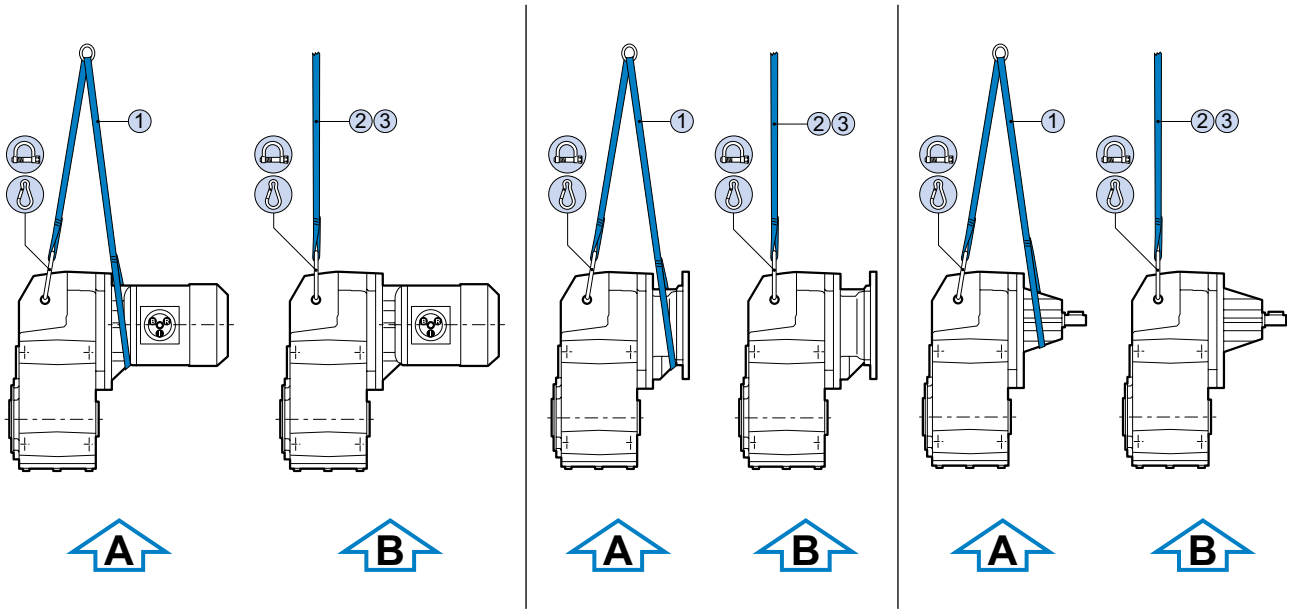
M Lift manually (weight ≤ 15 kg)
A Lift as per diagram A
B Lift as per diagram B

Maximum permissible tilt during handling: 15°



BONFIGLIOLI RIDUTTORI

Series F



	M05	M1	M2	M3	M4	M5	IEC	
F 10	M		A - B		—	—	M	M
F 20	A - B				—	—	M (P63...P90) A - B (P100...P112)	M
F 30	A				—	—	A	A
F 40	A - B					—	A - B	A - B
F 50	—	A - B				—	A - B	A - B
F 60	—	A - B					A - B	A - B
F 70	—	A - B					A - B	A - B
F 80	—	A - B					A - B	A - B
F 90	—	A - B					A - B	A - B

Reccomended:
solution A for positioning; solution B for positioning and handling.

① Ring harness

② Rope and hooks

③ Open harness with eyelets

Screw clamp (use with harness)

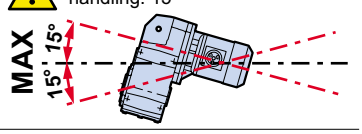
Snap hook (use with rope)

M Lift manually (weight ≤ 15 kg)

A Lift as per diagram A

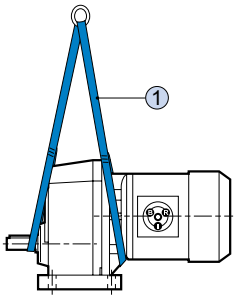
B Lift as per diagram B

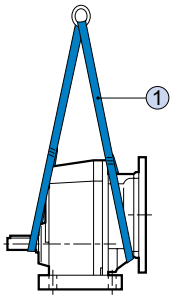
Maximum permissible tilt during handling: 15°

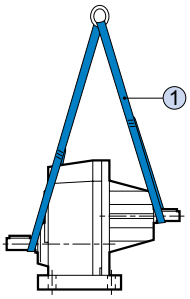


Series S

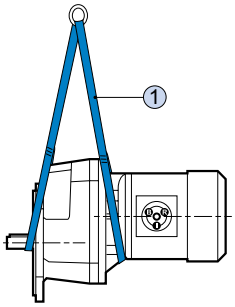
P

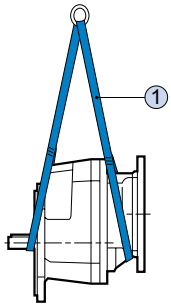


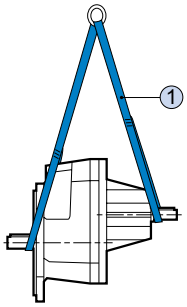


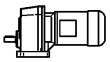


F







	 M05	M1	M2	M3	M4	IEC	
S 10 1	M		A		—	M	M
S 20 1	M		A		—	M	M
S 30 1	M		A		—	M	M
S 40 1	A					A	A
S 50 1	A					A	A

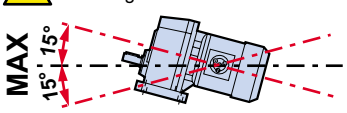
Reccomended:
solution A for positioning.

① Ring harness

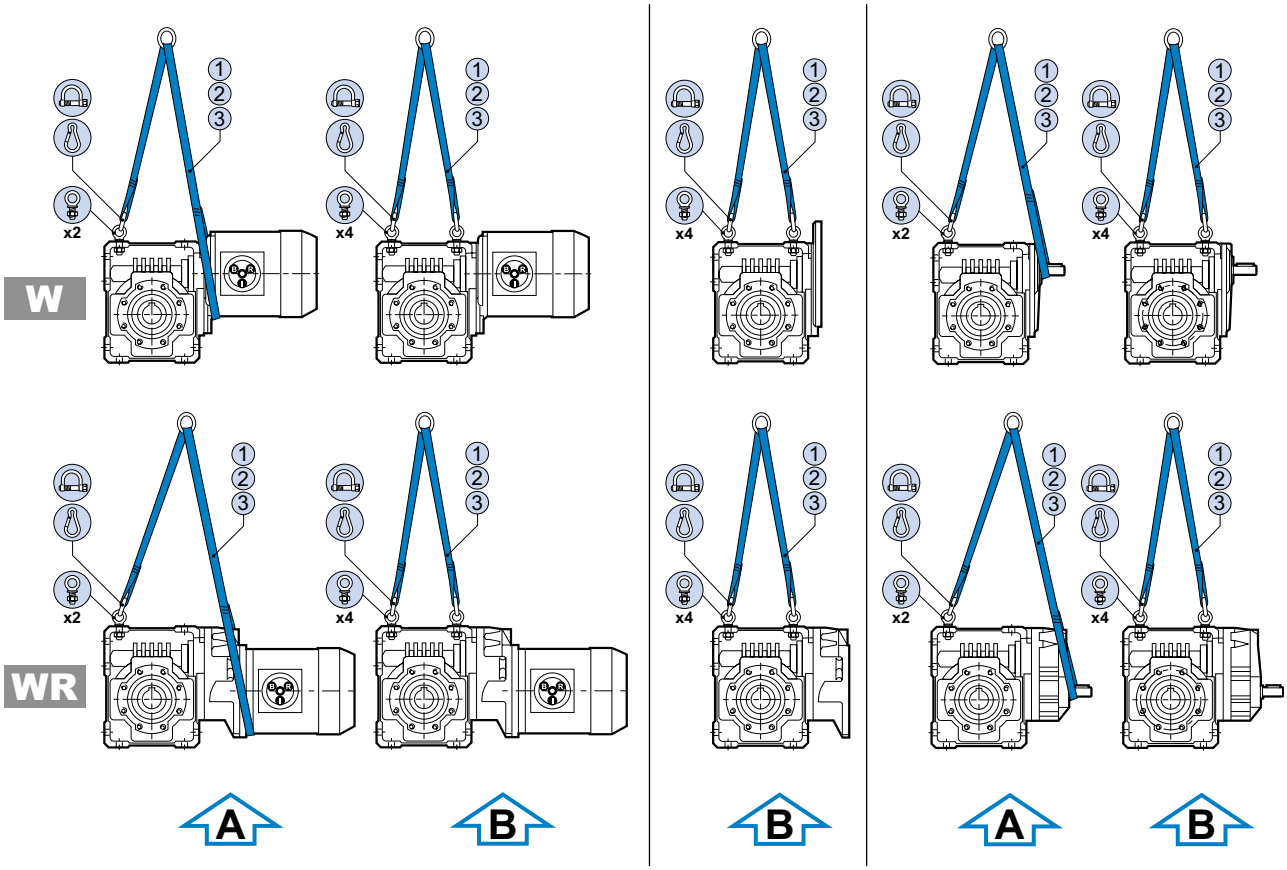
M Lift manually (weight ≤ 15 kg)

A Lift as per diagram A

Maximum permissible tilt during handling: 15°



Series W



			IEC	
W 63	**WR 63**	M	M	M
W 75	**WR 75**	A - B	M	M
W 86	**WR 86**	A - B	M	M
W 110	**WR 110**	A - B	B	A - B

Reccomended:
solution A for positioning; solution B for positioning and handling.

① Ring harness

② Rope and hooks

③ Open harness with eyelets

Screw clamp (use with harness)

Snap hook (use with rope)

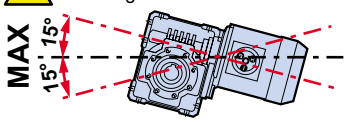
Eyebolt

M Lift manually (weight ≤ 15 kg)

A Lift as per diagram A

B Lift as per diagram B

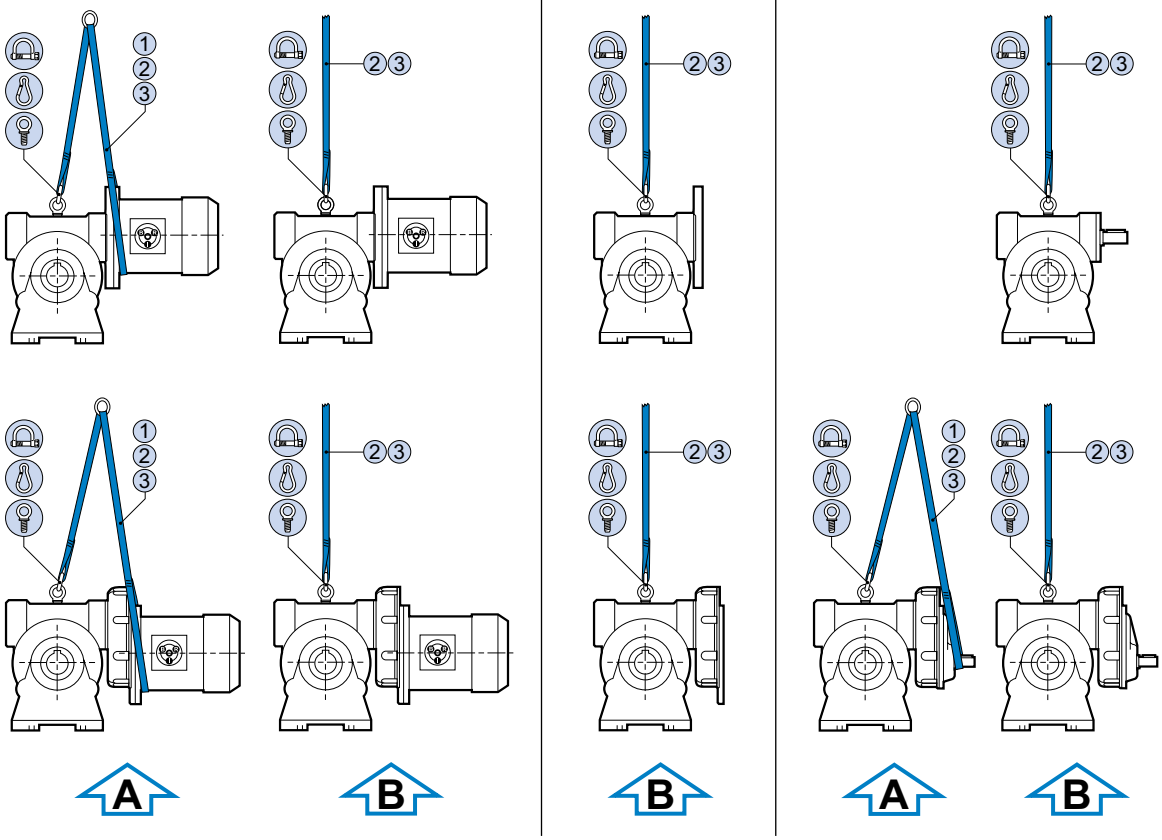
Maximum permissible tilt during handling: 15°



Series VF

VF

VFR



VF 30		M		
VF 44	**VFR 44**			
VF 49	**VFR 49**			
VF 130	**VFR 130**	A - B	A - B	A - B
VF 150	**VFR 150**			
VF 185	**VFR 185**			
VF 210	**VFR 210**			
VF 250	**VFR 250**			

Reccomended:
solution A for positioning; solution B for positioning and handling.

① Ring harness

② Rope and hooks

③ Open harness with eyelets

Screw clamp (use with harness)

Snap hook (use with rope)

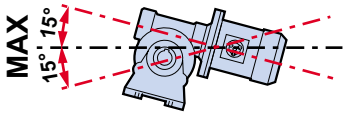
Eyebolt (already fitted to gear units VF130...VF250)

M Lift manually (weight ≤ 15 kg)

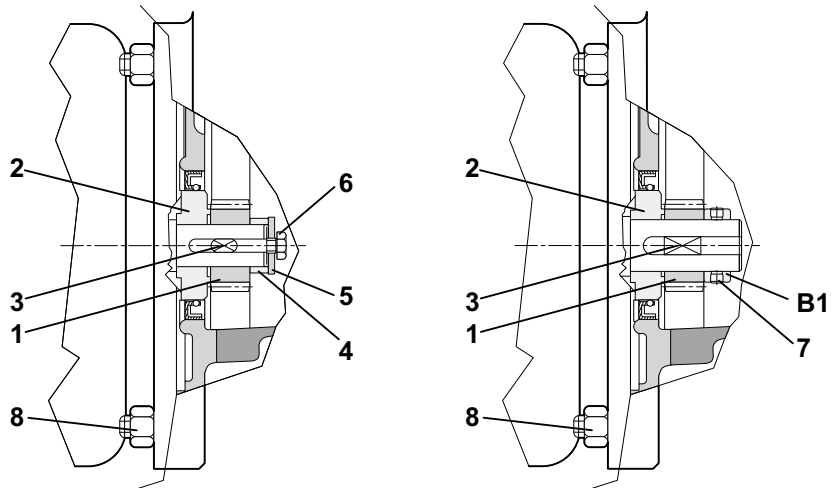
A Lift as per diagram A

B Lift as per diagram B

Maximum permissible tilt during handling: 15°



ANNEX 5 - INSTALLING THE MOTOR ON TYPE VFR WORM GEAR UNITS



1) Thoroughly clean and degrease the motor shaft and pinion (**1**) and bushing (**2**) coupling surfaces.
2) Check the motor shaft tolerance meets the following specifications:

Shaft diameter - ∅ [mm]	Tolerance
11 - 28	j6
38 - 48	k6

3) Preheat the bushing (**2**) and pinion (**1**) to 80-100 °C.
4) Quickly fit, the bushing (**2**), key (**3**) and pinion (**1**), in succession, to the motor shaft.
   When fitting the bushing (**2**), ensure that the chamfered side is facing the operator.
   To facilitate mounting, lightly press on the parts being fitted (e.g. with a tubular drift). Make sure that the reaction force in this case is supported at the opposite end of the shaft, and not by the fan cover.
   After this procedure the pinion (**1**) should be snug against the bushing (**2**).
5) Lock the assembly with the spacer (**4**) and washer (**5**) by tightening down the bolt (**6**) or, for configurations which have this option, fit the stop bushing (**B1**) and tighten down the two grub screws (**7**) while holding it snug against the pinion (**1**); see figure on the right.
6) Lubricate the seal ring lips with a film of grease.
7) For type VFR 49 units, which are lubricated for life and, hence, do not have a service plug, fill with the quantity of lubricant specified in the corresponding chapter of the catalogue dealing with lubrication of VFR units.
8) Hold the motor firmly and, holding it in alignment, mount it to the flange of the additional helical reduction casing. Take the greatest care to avoid denting the pinion or gear wheel teeth.
9) With the motor and gear unit flanges in contact, fully tighten down the mounting bolts (**8**) gradually and in a cross-wise pattern.
10) For units VFR 110 to VFR 250 the lubricant must be changed periodically.
    The lubricant charge (fil) for these gear units is given in the VF catalogue. Check that the correct level has been reached via the sight glass, with the gear unit in its specified mounting position. Top up as necessary.

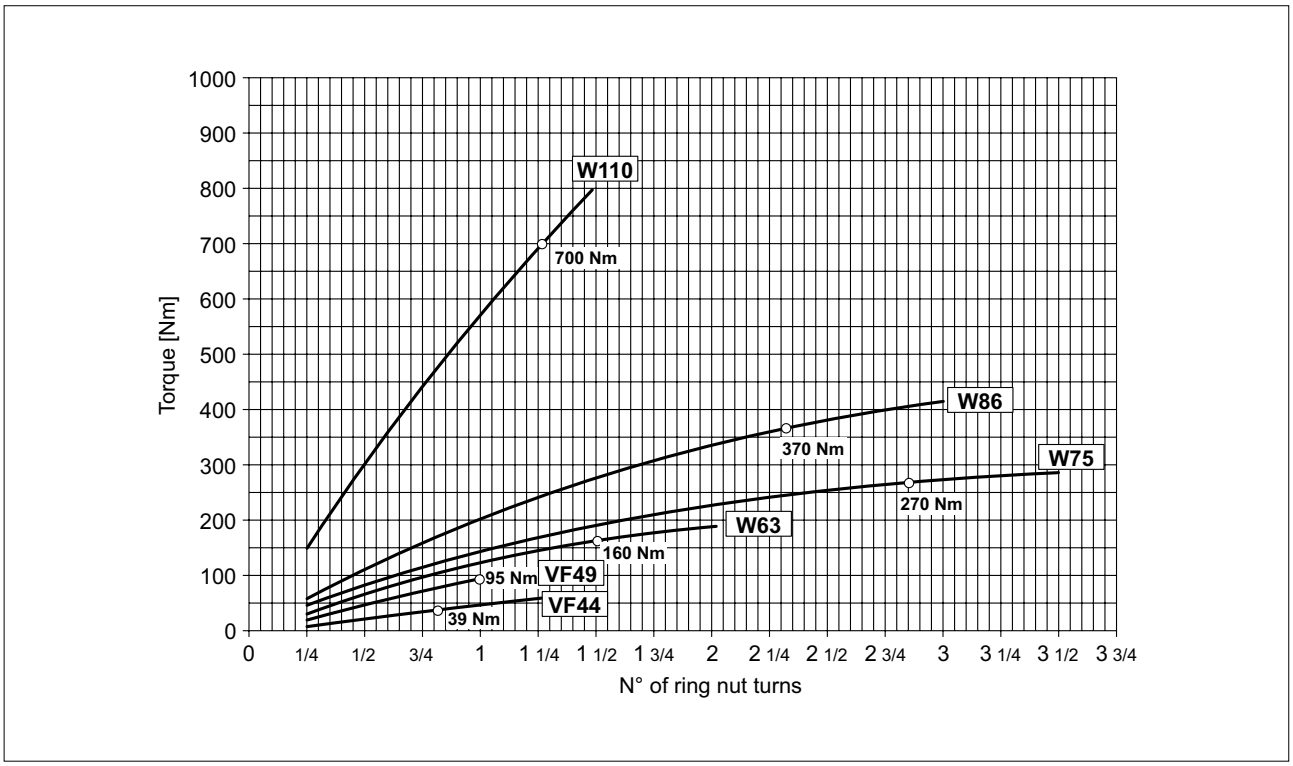
ANNEX 6 - CALIBRATING THE TORQUE LIMITER SLIP TORQUE

The torque limiter is an optional device available for worm gear units of the following types: VF 44L, VF 49L, W 63L, W 75L, W 86L and W 110L.

The device is factory calibrated to a slip torque which coincides with the nominal torque Mn_2 [n_1= 1400] for the gear unit in question.

This is achieved as follows. The same operations, with exclusion of step (2), allow the User to calibrate the limiter to a torque different to that set in the factory.

1. The calibration ring nut is screwed in until the disk springs are loaded to the point that they cannot be turned freely by hand.
2. A centre punch is used to make two corresponding reference marks at the same angular position on the ring nut and the protruding section of the output shaft. This reference position is the starting point from which all further turns of the ring nut are counted, and thus, the torque calibration is measured.
3. The ring nut is now screwed in by the fractions of a turn which correspond to the nominal torque Mn_2 for the gear unit in question. The reference in this case is given by the diagram below, which is also to be used for any new settings required over time.



INDEX OF REVISIONS (R)

R3
35 Corrected oil quantities for gear units VF 150.

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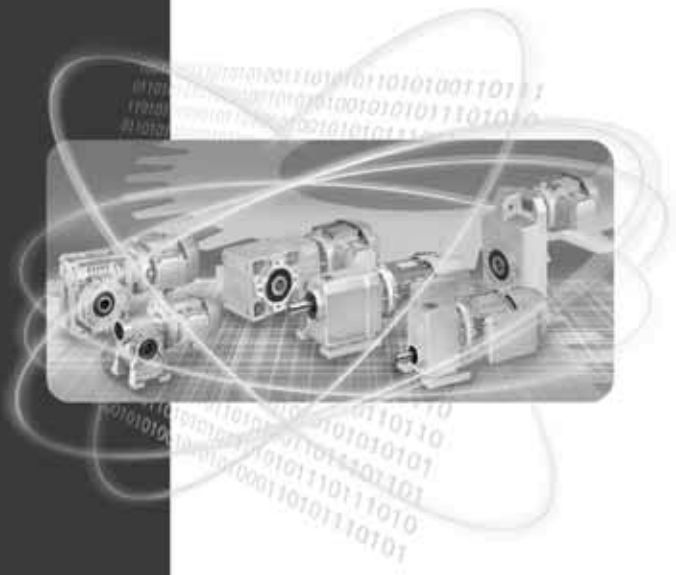

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